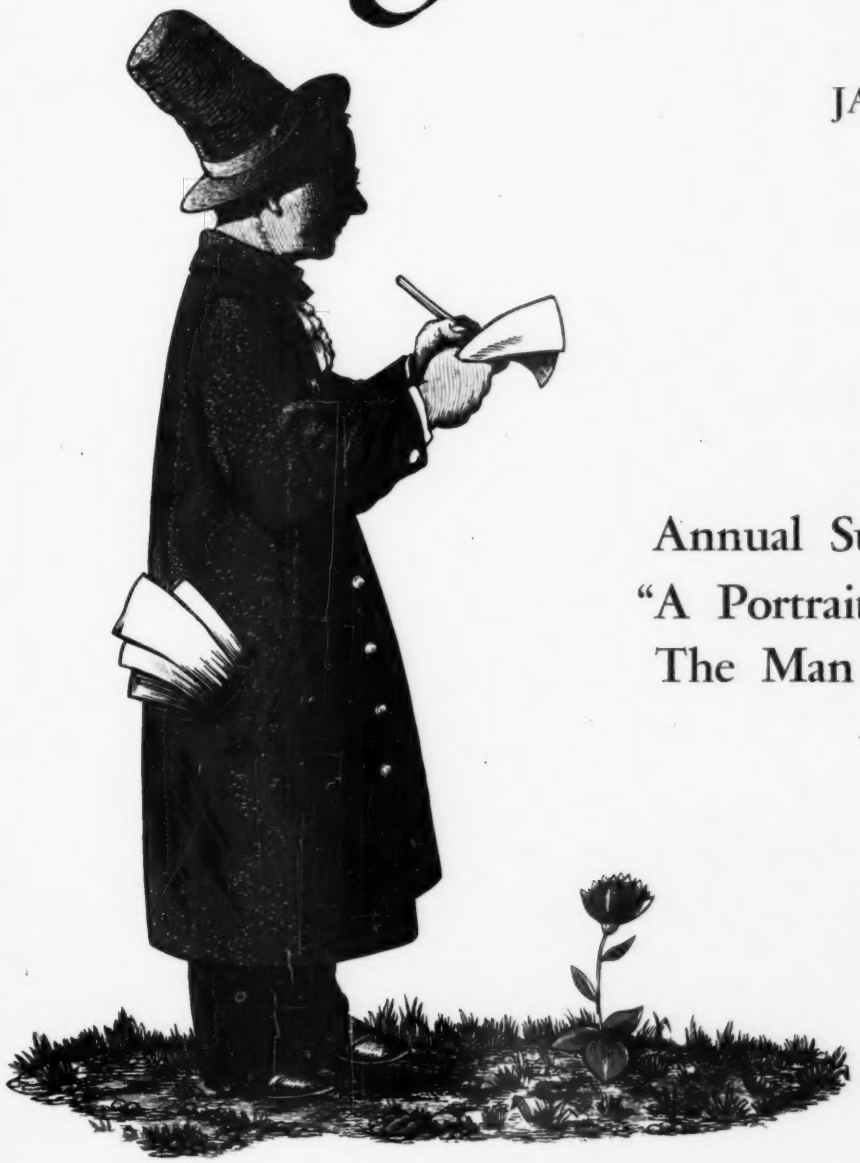
Consulting Engineer

JANUARY 1960



Annual Survey . . .
"A Portrait of
The Man at the Top"

OVER 1000 AUTHORIZED ADVANCE SERVICE-STOCKING DISTRIBUTORS DISPLAY THIS PLAQUE

In Hickory, North Carolina, and in hundreds of other cities in the U.S.A., there is an Authorized Service-Stocking Distributor to supply ADVANCE fluorescent lamp ballasts for immediate replacement.

Now it is easier than ever to get immediate replacement service for any make fluorescent lamp ballast whenever replacement is necessary. Over 1000 ADVANCE Service-Stocking Distributors throughout the United States have been authorized to display the sign at the left. They carry a complete stock of all ADVANCE ballasts, individually packaged.

For immediate service take the inoperative ballast, regardless of make, to any authorized ADVANCE distributor. He will consult his ADVANCE Cross-Reference Guide for the correct replacement ballast and supply it off the shelf from his stock. Remember, look for this sign. It's your guarantee of immediate replacement service with quality ADVANCE Ballasts. Write for your copy of the ADVANCE Service-Stocking Distributor list today!

ADVANCE®
CBM CERTIFIED
World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts
TRANSFORMER CO.
2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

Skid-mounted and air-transportable, the new ALCO *portable reactor system can be installed for power generation anywhere in the world.*

THE NEW OUTPOSTS OF NUCLEAR PROGRESS

With the advent of nuclear power, defense planners saw an ideal solution to the problem of fuel supply for remote outposts . . . provided that nuclear plants could be erected in these isolated areas. Now, an ingenious nuclear-power package, completely transportable by air, has been developed by ALCO Products, Inc.

Called the PM-2A (portable medium power reactor), the ALCO plant has recently been purchased by the U.S. Army for use in a remote, frigid location. One core-loading—40 lb of uranium—will provide for two years' operation and replace 2.6 million gallons of fuel oil.

This will be the third ALCO nuclear-power plant. At Fort Belvoir, Va., the world's first nuclear station for power generation has been in operation since early 1957. A second reactor system is now being built by ALCO for Army duty in Alaska.

In addition to complete systems, ALCO has pioneered the design and fabrication of a wide range of nuclear components. Nine out of 10 major U.S. nuclear plants incorporate ALCO components.

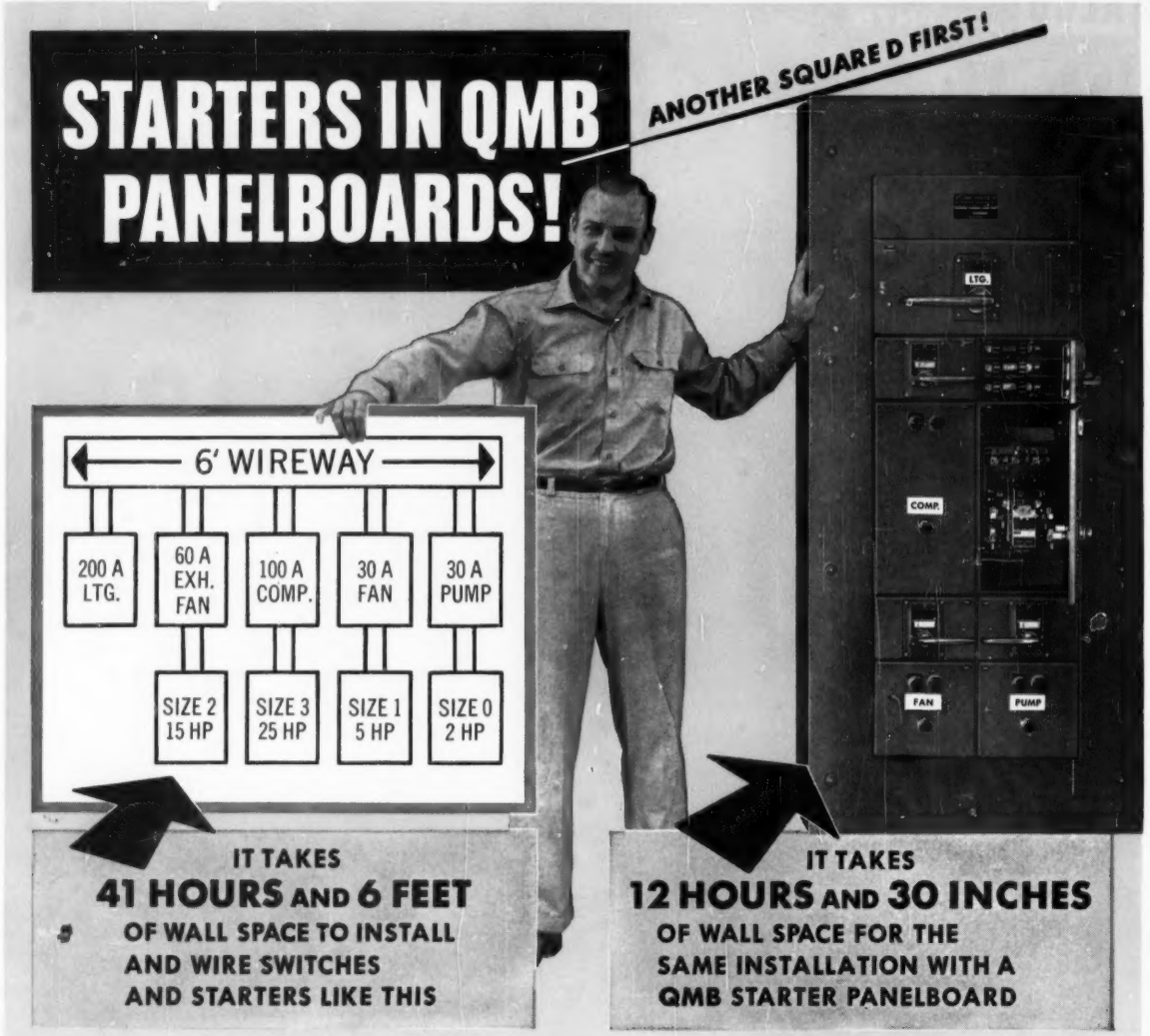
For complete facts on ALCO's nuclear capability, write: ALCO Products, Inc., Dept. 115, Schenectady, N.Y.

ALCO PRODUCTS, INC., New York · **Sales Offices in Principal Cities** · **Makers of:** *Nuclear Reactors · Locomotives · Diesel Engines · Heat Exchangers · Forgings · Springs · Steel Pipe · Oil Field Equipment*

ALCO

STARTERS IN QMB PANELBOARDS!

ANOTHER SQUARE D FIRST!



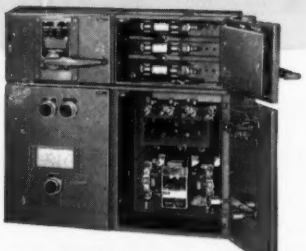
IT TAKES
41 HOURS AND 6 FEET
OF WALL SPACE TO INSTALL AND WIRE SWITCHES AND STARTERS LIKE THIS

IT TAKES
12 HOURS AND 30 INCHES
OF WALL SPACE FOR THE SAME INSTALLATION WITH A QMB STARTER PANELBOARD

QMB MEANS LESS TIME AND LESS SPACE PLUS

- **LOWER COST** • Time is money. The overall cost of QMB motor starters is usually less than that of separately installed starters and switches.
- **PLUG-IN FLEXIBILITY** • Plug-in switches and starters can be removed and installed in minutes. Minor circuit changes can be made without costly down time. Components easily rearranged if processes change.
- **ADDED SAFETY** • Interlocking prohibits opening starter or switch doors when switch is "ON."

QMB panelboards accommodate reversing and non-reversing starters, sizes 0 through 4. QMB switchboards and unit substations handle sizes 0 through 5. Part winding and two-speed starters available on order. All components available factory-assembled and wired. Enclosures, starters and plug-in switch units are also stocked by your Square D distributor for on-the-job assembly.



Notice how the PLUG-IN switch unit is mounted directly above the starter, permitting interlocking. The starter cannot be opened when the switch is in the "ON" position.

It's easy to order these starter and switch units. See your latest Square D Digest for further information.

SQUARE D COMPANY

wherever electricity is distributed and controlled

Consulting Engineer®

For Engineers in Private Practice

Wayne near Pleasant Street
Saint Joseph, Michigan

January 1960 • VOLUME XIV• NUMBER I

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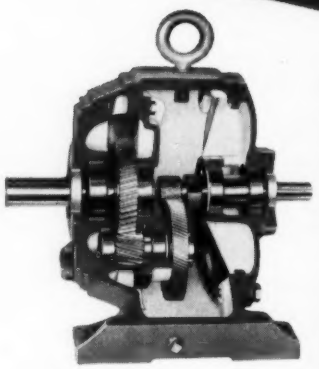
Now from Jones

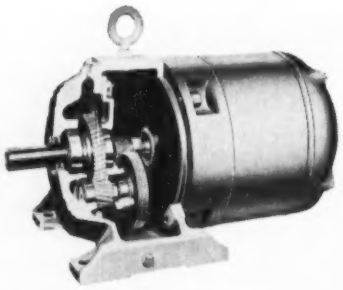
SPEED REDUCERS

NEW! Jones All-Motor Type Gearmotors

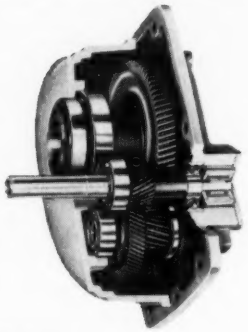
Designed with high-hardness gearing for longer life. One-piece low speed end housing construction insures gear alignment and prevents oil leakage. Compact design. All three types available for foot-mounted or flange-mounted installation, and for horizontal or vertical application. Capacity is up to 250 hp.



NEW! Jones In-Line Helical Reducers



NEW! Jones Integral Type Gearmotors



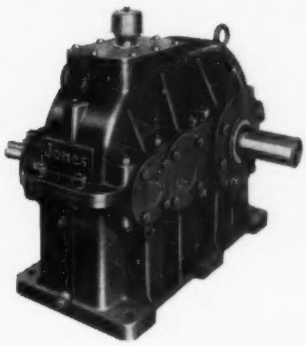
NEW! Jones Shaft-Mounted Reducers

High-hardness gearing gives compact design and extra service life. Positive sealing against oil leakage through double lip type seals. All gearing straddle-mounted between anti-friction bearings. Single and double reduction units to 40 hp. Six standard sizes. Flange-mounted units available in three standard sizes.

FOR EVERY PURPOSE!

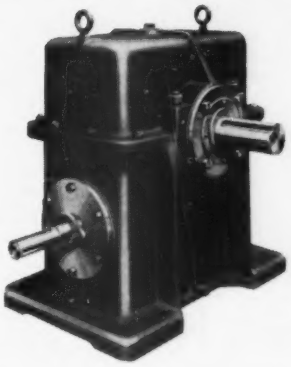
One of the most comprehensive speed reducer lines in industry! With new shaft-mounted reducers, in-line helical reducers, and gearmotors, Jones now offers a wide selection for all your power transmission needs. New technical bulletins give you exactly the information you need for proper selection of units in accordance with latest A.G.M.A. ratings. Be sure to ask your Jones representative for copies, or write Hewitt-Robins, Stamford, Connecticut, for this literature:

All-Motor and Integral Type Gearmotors . Bulletin 1-13-J17
In-Line Helical Reducers . . . . . Bulletin 1-13-J18
Shaft-Mounted Reducers . . . . . Bulletin 1-13-J19
Herringbone Gear Reducers . . . . . Bulletin 1-13-100
Worm Gear Reducers . . . . . Bulletin 1-13-J13
Worm-Helical Reducers . . . . . Bulletin 1-13-J14



Jones Herringbone Gear Reducers

Accepted throughout industry; balanced design, heavy-duty roller bearings, rugged cast iron housing for reliable service and low maintenance costs. The most complete parallel shaft line in industry.



Jones Worm Gear Reducers

Horizontal and vertical shaft types available with ratios to 80:1. Heavy-duty roller bearings throughout with high-test cast iron housings for positive gear alignment.

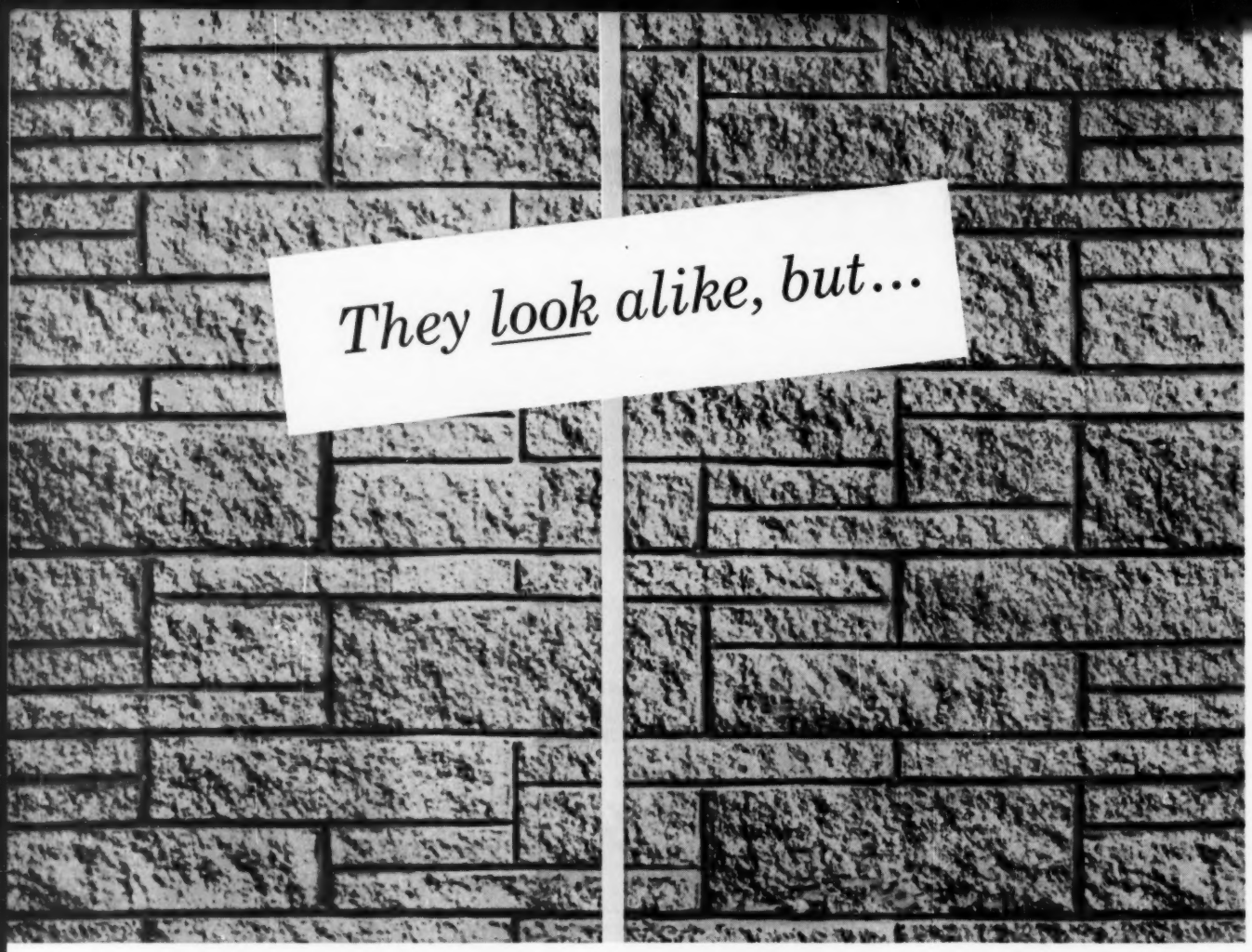
Jones Worm-Helical Reducers

For vertical output shaft service; ratios from 25.63:1 to 357.5:1. Provide optimum combination of initial cost, efficiency, and low maintenance. Proven in hundreds of installations; redesigned to incorporate latest improvements in metallurgy and reducer design.

HR HEWITT-ROBINS

THE NAME THAT MEANS EVERYTHING IN BULK MATERIALS HANDLING SYSTEMS . . .

CONVEYER BELTING AND IDLERS • POWER TRANSMISSION DRIVES • INDUSTRIAL HOSE • VIBRATING CONVEYORS, SCREENS & SHAKEOUTS



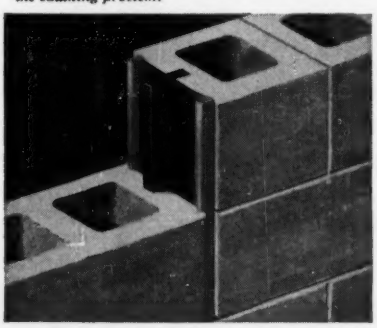
it takes Dur-o-wal to keep them alike!

Two masonry walls: They can be twins in surface charm and solidity. Yet, one can be the better building investment—free of maintenance problems for important extra years. That's the one built with Dur-o-wal, the original steel masonry wall reinforcement.

A wall reinforced every second course with Standard Weight Dur-o-wal has 71 per cent greater flexural strength than its unreinforced counterpart.

With its trussed design, butt-welded construction, scientifically deformed rods, Dur-o-wal is considered the most practical thing of its kind by builders everywhere. Nationally wanted, Dur-o-wal is nationally distributed. Wherever you build a masonry wall, you can get Dur-o-wal.

Two engineered products that meet a need. Dur-o-wal reinforcement, shown above, and Rapid Control Joints, below. Weatherproof neoprene flanges on the latter flex with the joint, simplify the caulking problem.

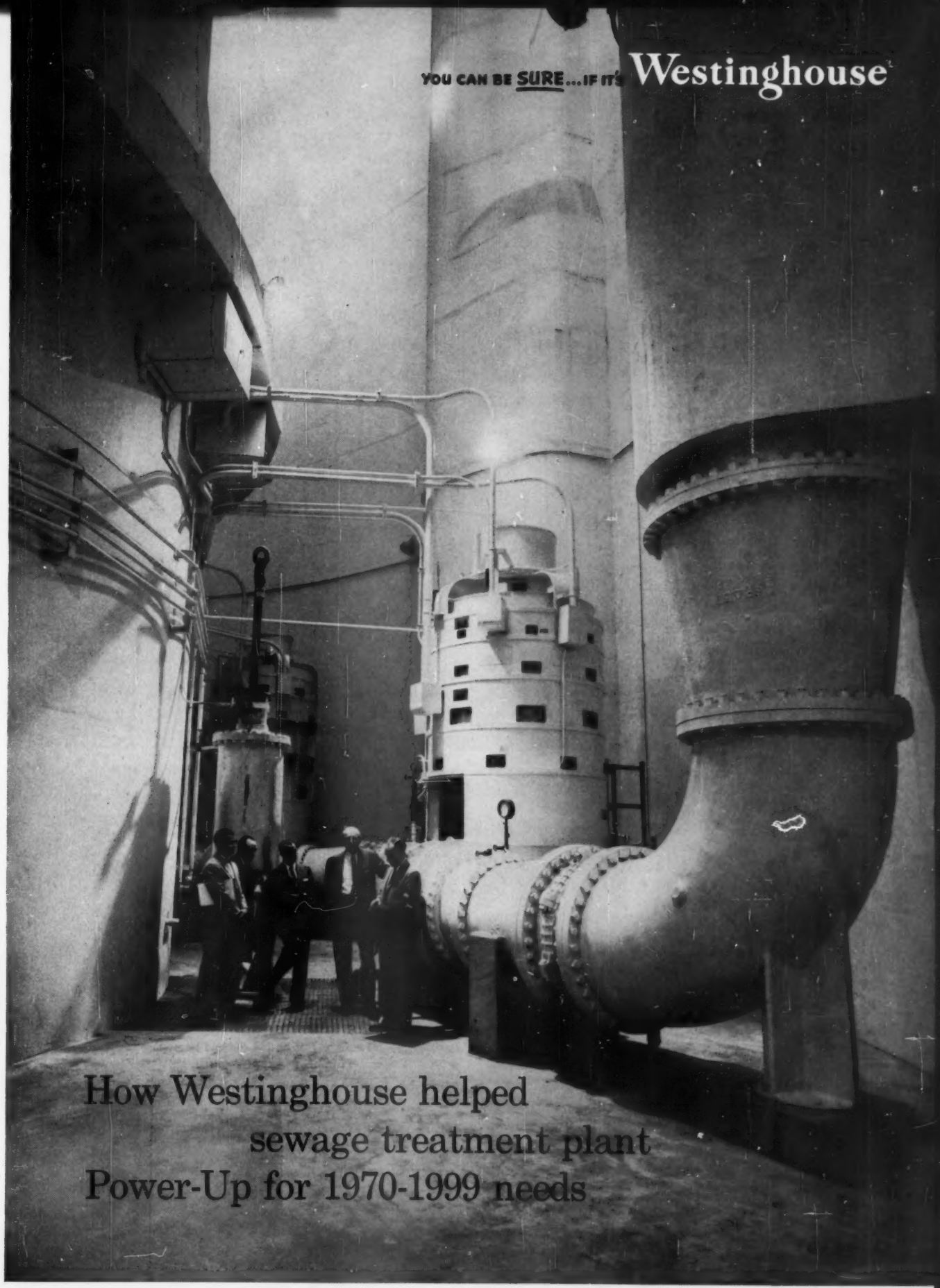


DUR-O-WAL®

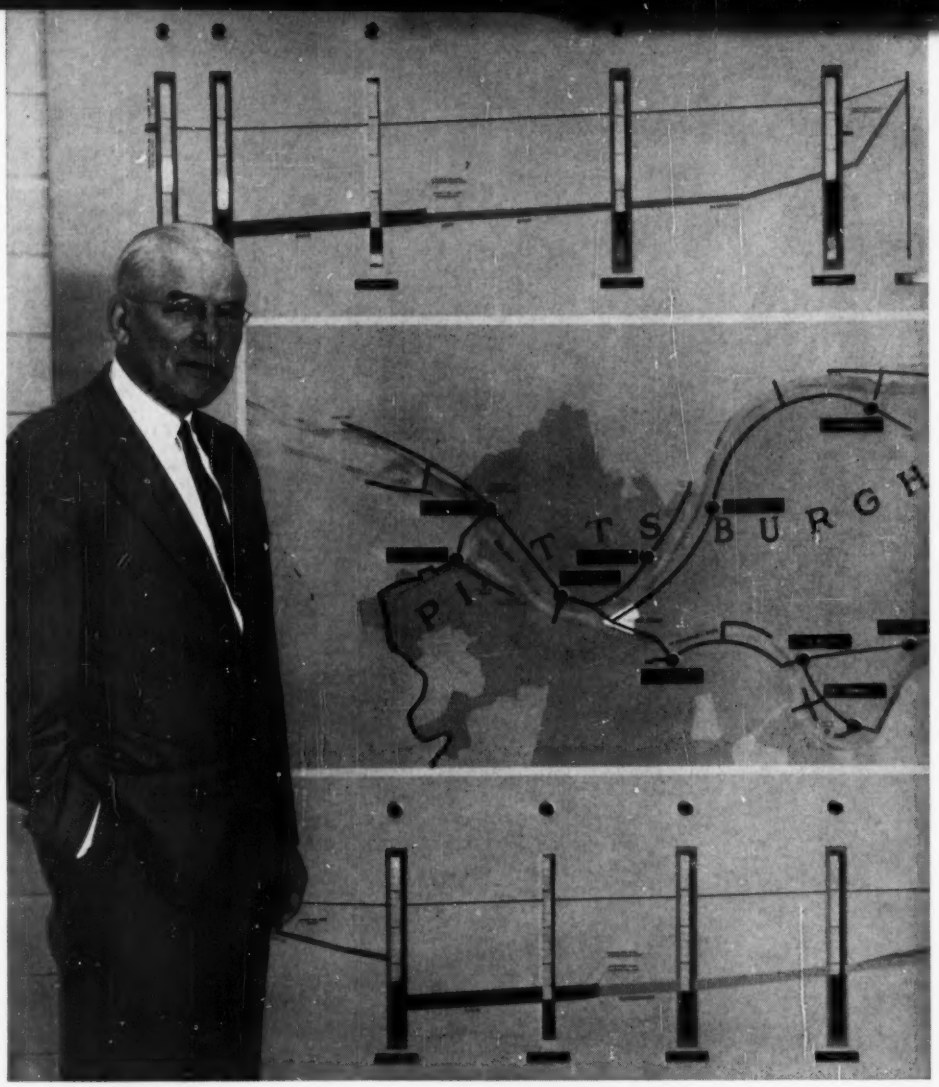
Masonry Wall Reinforcement and Rapid Control Joints

RIGID BACKBONE OF STEEL FOR EVERY MASONRY WALL

Dur-O-wal Div., Cedar Rapids Block Co., **CEDAR RAPIDS, IA.** Dur-O-wal Prod., Inc., Box 628, **SYRACUSE, N. Y.** Dur-O-wal Div., Frontier Mfg. Co., Box 49, **PHOENIX, ARIZ.** Dur-O-wal Prod., Inc., 4500 E. Lombard St., **BALTIMORE, MD.** Dur-O-wal of Ill., 119 N. River St., **AURORA, ILL.** Dur-O-wal Prod. of Ala., Inc., Box 5446, **BIRMINGHAM, ALA.** Dur-O-wal of Colorado, 29th and Court St., **PUEBLO, COLO.** Dur-O-wal Inc., 165 Utah Street, **TOLEDO, OHIO**


YOU CAN BE SURE...IF IT'S Westinghouse
How Westinghouse helped
sewage treatment plant
Power-Up for 1970-1999 needs

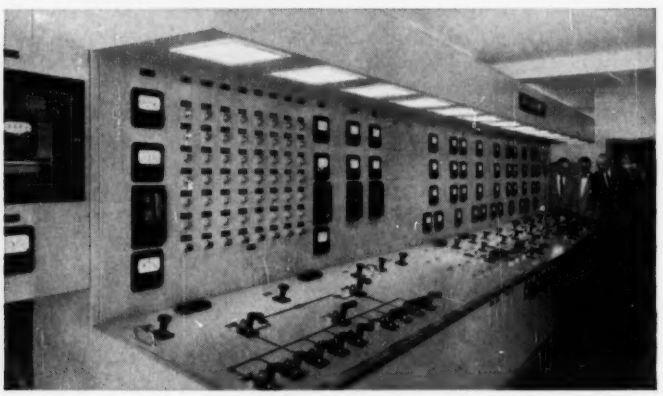
Front Cover: View in dry well of main sewage pump driven by Westinghouse 450/1250-hp 2-speed vertical synchronous motor in foreground. Constant-speed 800-hp motor in background drives its pump through a variable-speed magnetic coupling. Dry well is illuminated with Westinghouse VEK-16 floodlighting. Discussing installation are: A. B. Janaszek, Westinghouse Sales Engineer; M. B. Trimble, Westinghouse Construction Engineer; N. J. Grady, Devlin & Ernst, Electrical Contractors; J. F. Laboon, Executive Director and Chief Engineer, Allegheny County Sanitary Authority; A. A. Thomas, Engineer for Operations, Metcalf & Eddy, Consulting Engineers.



J. F. Laboon, Executive Director and Chief Engineer of Allegheny County Sanitary Authority, shown beside system flow panel of the $100 million trunk sewer and treatment plant project which serves 70 separate communities. The mimic diagram depicts flow conditions throughout a 69-mile network of tunneled interception sewers. The plant and its operation incorporate the process of concentrating undigested sludge for incineration.

J-94134-2

Examining sewage treatment system plans in the director's office are N. J. Grady, M. B. Trimble, A. B. Janaszek, J. F. Laboon and A. A. Thomas.



Over-all view of the main duplex control board installed in the sewage pump station. This board centralizes control of the incoming power feeders, indicates alarm conditions for each main sewage pump and also provides centralized control of pump motor speeds and performance. Shown at far end of control board are A. A. Thomas, A. B. Janaszek, J. F. Laboon and N. J. Grady.

Pittsburgh Sewage Treatment Plant builds for population growth of next 40 years

Planning by the Allegheny County Sanitary Authority went far beyond today's needs to anticipate the requirements of 1970 and beyond, to the year 2000. The new Pittsburgh Sewage Treatment Plant which serves the combined populations of 70 separate communities is now capable of handling the increased demands of 1970 populations. In addition, those structures and conduits which are not readily expandable are designed for the ultimate flow demands of the year 2000.

The Westinghouse electrical distribution system specified was planned with the same anticipation of future needs. Each component was selected to perform as part of the completely coordinated system. The entire system is capable of ready expansion to meet the increased power requirements of the future operating load of the plant.

Westinghouse electrical equipment supplied to Power-Up this 150-mgd sewage treatment project (max. rate, 300 mgd) includes:

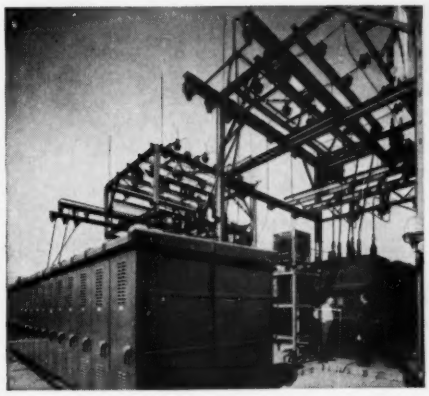
- 10,000-kva outdoor substation.
- Main pump control board.
- Three main sewage pump motors (vertical, synchronous), 1250/450 hp, two speed, two frame.
- Two main sewage pump motors (vertical, synchronous), 800 hp, 400 rpm.
- Two major assemblies of high-voltage fused starters and metal-clad switchgear.
- Five indoor dry-type power centers (150 to 3000 kva).
- Seventeen motor control centers as well as panelboards, dry-type transformers and standard controls.
- Westinghouse Life-Line® motors and gear drives which are utilized on pump, conveyor and auxiliary drives.

(contd.)

YOU CAN BE **SURE**...IF IT'S

Westinghouse

J-94134-3

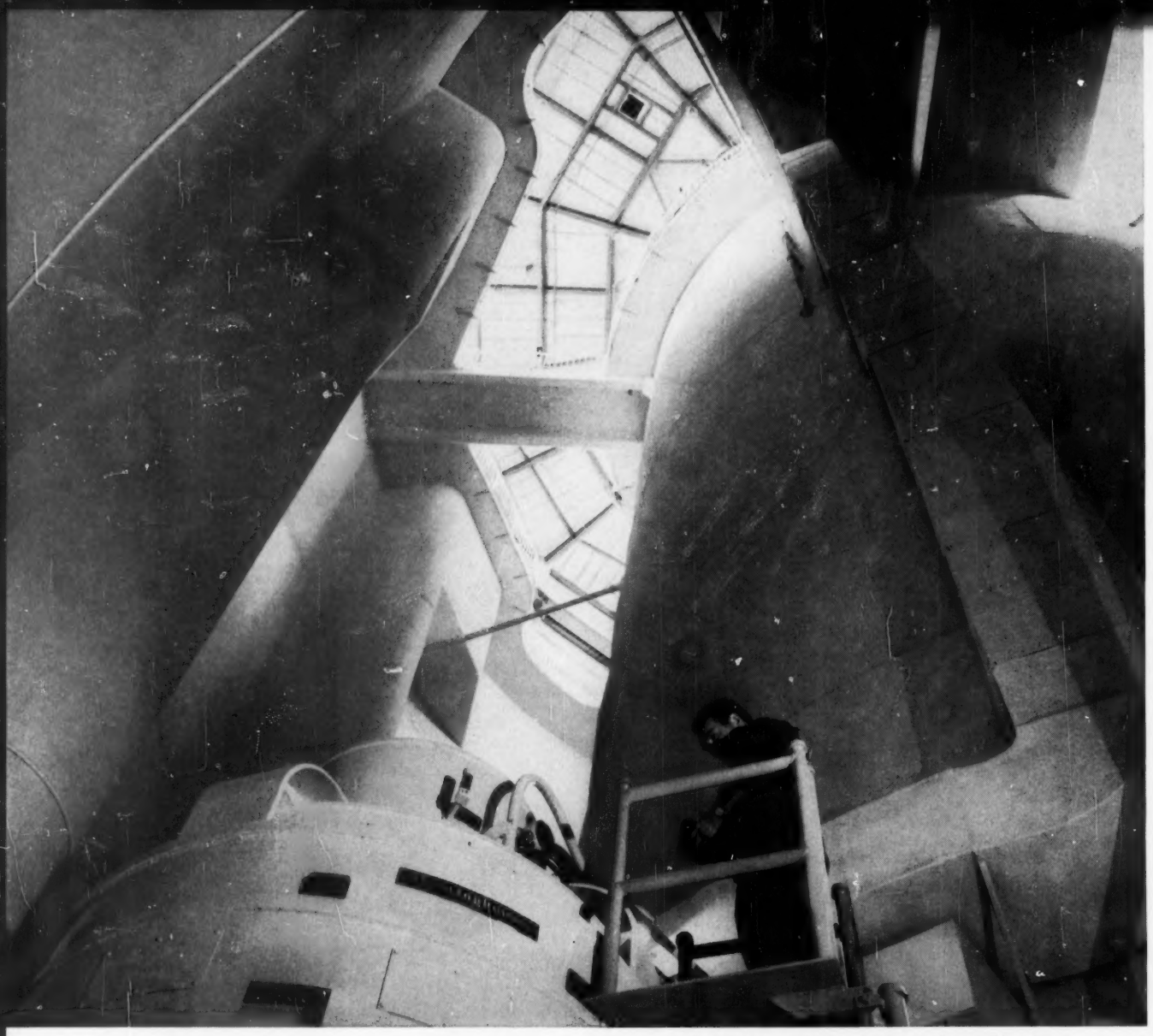


General view of outdoor substation at Pittsburgh Sewage Treatment Plant. Shown is Westinghouse metal-clad switchgear used for incoming line, bus-tie and distribution service, as well as one of the 5000-kva oil-insulated power transformers at the station. Also shown are Westinghouse disconnect switches, grounding resistors and outdoor substation structure. M. G. Grasha, Plant Electrical Engineer, discusses installation with M. B. Trimble.

A. A. Thomas, J. F. Laboon, N. J. Grady and A. B. Janaszek shown in main control room with line-up of Westinghouse Ampgard* fuse starters for control of the main sewage pumping motors. Metal-clad switchgear in the middle of the assembly provides incoming line protection for each starter group.

*Trade-Mark

M. B. Trimble and M. G. Grasha inspect electrical equipment in administration building basement. At right is rear of motor control center close-coupled to 150-kva dry-type power center transformer; at left is a 75-kva Type DT-3 dry-type transformer feeding a Westinghouse NLAB lighting panelboard.



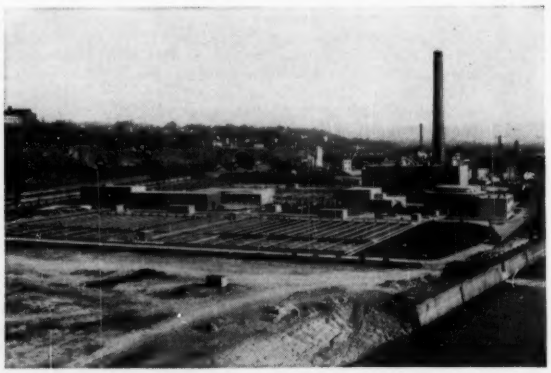
General view of main pump station looking from the bottom of the dry well up to the main operating floor level 120 feet above.

Sewage plant builds for next 40 years (contd.)

Powering-Up electrically for future growth provides many initial and future savings in public works projects. For information as to what such savings can mean to you, call the Westinghouse electrical construction engineer nearest you, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-94134-4

OWNER: Allegheny County Sanitary Authority
CONSULTING ENGINEERS: Metcalf & Eddy, Boston, Mass.
CONSULTING ARCHITECTS: Celli-Flynn, McKeesport, Pa.
ELECTRICAL CONTRACTORS: Devlin & Ernst, Pittsburgh, Pa.

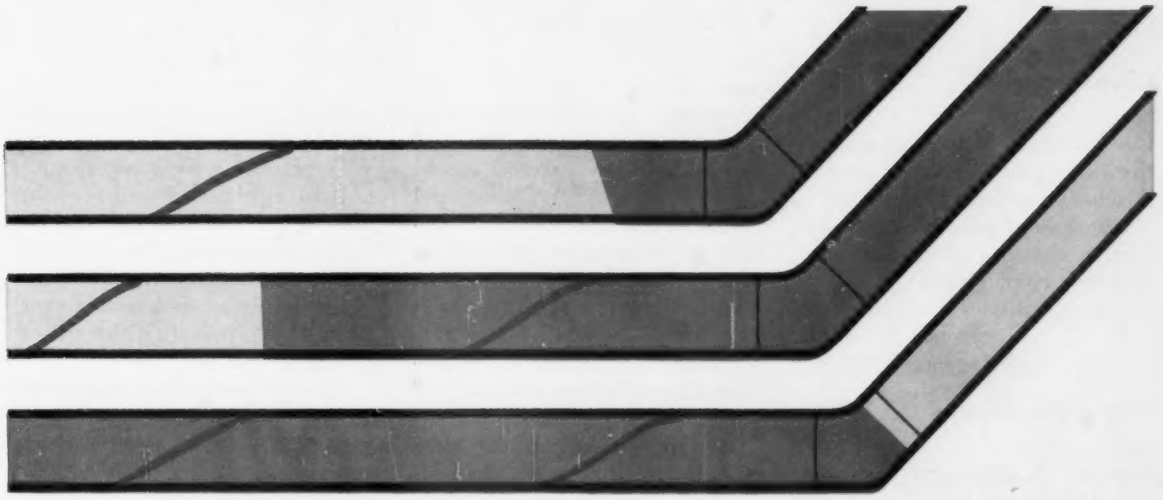
Over-all view of Pittsburgh Sewage Treatment Plant. In foreground are the main sedimentation tanks and the effluent channel which discharges into the Ohio River. Circular building at far right is main pump station, behind which is the incinerator building with 300-ft-high stack, a landmark of the installation.



YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

4-D WROUGHT IRON STEAM RETURN LINES



STEAM CONDENSATE CORROSION: the cause, the effect, and a suggested safeguard

4-D represents the most significant development in the history of wrought iron metallurgy. It was achieved by substantially increasing the deoxidation of the base metal, slightly increasing the phosphorous content and using a more siliceous iron silicate. Result is increased corrosion resistance, improved mechanical and physical properties.

Write for new 4-D Wrought Iron literature and our special report, The Use of Wrought Iron in Steam Condensate Lines. A. M. Byers Company, Clark Building, Pittsburgh 22, Pa.

WHAT CAUSES STEAM CONDENSATE—Steam, losing its heat, turns to moisture as temperature drops below saturation level. This condensate is distilled water, greedy for gases. Any gas in the steam is readily absorbed into this condensate as it cools. The condensate becomes violently corrosive to ordinary piping materials, depending upon the percentage of free CO_2 plus O_2 in the steam.

EFFECT OF STEAM CONDENSATE ON PIPE—Carbon dioxide is the primary cause of return line corrosion. Like oxygen, carbon dioxide is present in all raw waters and may enter the boiler with the feed water. Most of the carbon dioxide found in the steam cycle results from decomposition of the bicarbonate or carbonate content of the boiler feed water. Build-up of insoluble products of corrosion—particularly in smaller lines—may plug the pipe and render it useless. Corrosion may cause grooving, channeling, pitting, completely penetrating the pipe wall.

A PIPING MATERIAL THAT COMBATS IT—New 4-D Wrought Iron is a two-component metal consisting of high purity iron and iron silicate fibers. There are over 250,000 non-rusting glasslike fibers to every cross-sectional square inch. The purity of the iron itself, plus the protection of the iron silicate fibers are a mighty formidable deterrent to steam condensate corrosion and its deleterious effects.

BYERS 4-D WROUGHT IRON

Readers' Comment

Likes Biographies

Sir:

I would like to compliment you on the outstanding biographical sketches presented in your issues.

I find them interesting both in subject choice and presentation. Will they be published as a collection or as separates at a later date?

Ray O. Maurseth
Los Angeles, California

Likes Dome Report

Sir:

We are all impressed with the thoroughness of your symposium on geodesic – and other – domes.

And – besides being a miracle of organized and orderly reporting – it is so beautifully laid out and type-set that it is a joy to read!

Surely no one hitherto has given the subject such full and attractive coverage. We are grateful to you, too, for including Graver.

Robert F. Millett
Graver Tank & Mfg. Co.
East Chicago, Indiana

Interprofessional Praise!

Sir:

Congratulations! Your December issue of CONSULTING ENGINEER has just this minute come to me, and I think your thorough treatment of the whole matter of domes is superb. You have done a magnificent job of assembling a great deal of material. I intend to call attention to it in some way in the *Journal*. There are plenty of architects who would enjoy reading your comprehensive issue.

Joseph Watterson, AIA
Editor, *Journal*
American Institute of Architects
Washington, D. C.

California Water Plan

Sir:

Some day you should have a write-up of the California Water Plan. It is estimated that this Plan will cost $11½ billion and will extend some 750 miles through the central part of California. The first contract for construction on this Plan was let last week. This contract was for the first unit of the South Bay Aqueduct which is a side aqueduct branch off the main aqueduct. The cost of this first unit will be $8,300,000.

Most of the engineering work on this project is being done by the State Department of Water Resources but private consultants also are being used. The Bureau of Reclamation and the Army Engineers also are working on allied projects. In fact, the whole problem will be solved only by cooperation between State and Federal government, and local groups

George L. Sullivan
Consulting Engineer
Santa Clara-Alameda-San Benito
Water Authority
San Jose, California

Dissidence!

Sir:

Your editorial "From the Editor's Tranquil Tower" in the November issue of CONSULTING ENGINEER, page 46, makes a big to-do about the feasibility and programming of the survey being conducted by Task Force #5 of the Functional Section of Consulting Engineers in Private Practice, National Society of Professional Engineers, without offering anything in the way of constructive criticism.

True, the information will be used at Congressional hearings to display actual facts, on actual fees, on actual completed projects, and we feel that this display of effort on the part of consultants will provide authority for our request to have the Hoover Commission findings of 1955 up-dated.

Fortunately, your readers, with considerable effort and search, could have been able to piece the NSPE program together, for your staff writer, on page 82, also in the November issue, undermines your editorial by printing the other phases of our program.

Sir, my constructive suggestion is that you make every effort to present the entire story without concern of writing on a specific item as may be convenient to you, as the Editor.

Alfred H. Samborn, P.E., Chairman
Functional Section of Consulting
Engineers in Private Practice
National Society
of Professional Engineers
Toledo, Ohio

Concurrence!

Sir:

I've read and reread your delightfully untranquil voice shouting from your "Tranquil Tower" in the November issue of CONSULTING ENGINEER on summer madness. It is terrific. It is down to the point. It is completely justified. It is another feather in your cap if there is room for one more.

But the burden of my present song extends beyond the laudatory comments I have made. You have

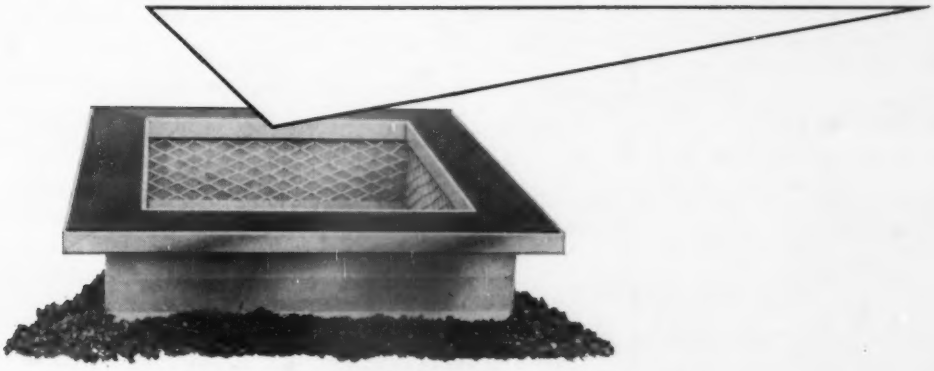
IT'S WHAT GOES INTO PENN'S SONOTROL CURB THAT MAKES IT SO DARN GOOD!

Ventilators fit like a glove when there's a self-flashing
EXTRUDED ALUMINUM
SONOTROL CURB*
on the job!

The newest way to curb roof ventilators eliminates the haphazards of field construction. Instead, you place your order for curb, ventilator and damper . . . everything fits . . . and there are no delays!

Penn devoted years to developing the Sonotrol Curb. Already in use in many installations, they're non-porous, seamless and weathertight! All aluminum construction reduces roof loading . . . makes them easy to install. Special acoustical insulated lining quiets roof exhauster sounds appreciably, and eliminates condensation.

Get into this modern way to curb now by requesting Bulletin SCE-89 from your local Penn Ventilator man or write direct.



PENN **VENTILATOR CO., Inc.**
PHILADELPHIA 40, PENNA.

A leading manufacturer of Powered and Gravity Roof Exhausters and Accessory Equipment for over 30 years.

Representatives and Distributors in Principal Cities
Charter Member of AMCA

*Your roof exhauster won't be as quiet as it should be unless you use the Sonotrol Curb

jolted us into a proposed action. When I say "us," I mean the Consulting Engineers Association of Oregon and its Public Relations Committee.

This summer madness on fees for consulting engineers, if it does not get nipped by the first autumnal frosts, will eventually lead to legislation or proposals for legislation. It is then that it becomes necessary for every Congressman to be informed on this subject. So, CEAO feels that it is obligated to inform the Congressmen in its area — those from Oregon. Therefore, we have worked out a program that should get the Congressmen of Oregon properly informed on the subject of fees, for we feel our Congressmen are our responsibility.

We hope that, with your help, we can devlop a new tranquilizing pill which will be a specific for this virus going around in Washington which develops ailments like the summer madness you have so well pinpointed.

J. Donald Kroeker, Chairman
Public Relations Committee
Consulting Engineers
Association of Oregon
Portland, Oregon

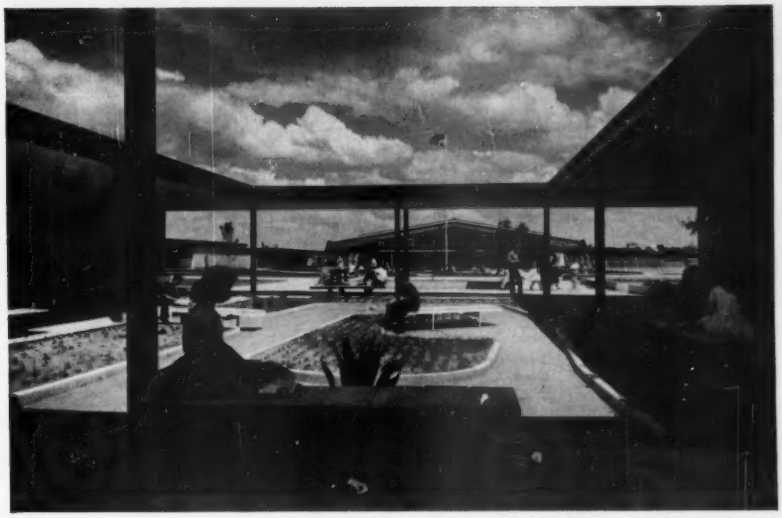
Comments from Sweden

Sir:

I have been commissioned by my colleagues of the Swedish Association to give our comments upon CONSULTING ENGINEER magazine.

To begin with, let me state that we are all very glad to receive CONSULTING ENGINEER every month. Our general opinion is also that the magazine, which, we understand, is not directly connected with the organizations of the American consulting engineers, is nevertheless a worthy representative of the few publications which have made it their task to debate on a wide basis all questions connected with the consulting engineering profession.

Generally, all information contained in articles dealing with the build-up and organization of American consulting engineering



San Angelo Central High School, San Angelo, Texas Ulric Meisel photo

primary and secondary pumping with B&G® PUMPS keeps horsepower down

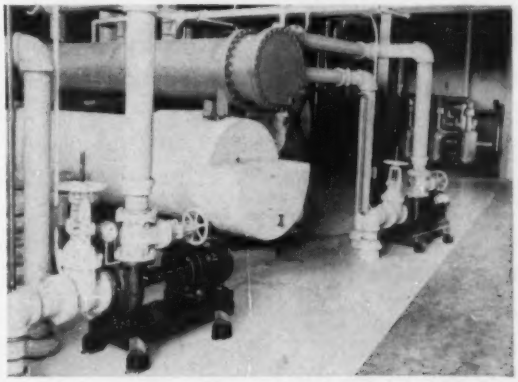
Architects: Caudill, Rowlett & Scott—Houston, Texas, Oklahoma City, Okla., Corning, N. Y. and Stamford, Conn.
Associate Architect: Max D. Lovett—San Angelo, Texas
Engineer: J. W. Hall—Bryan, Texas
Mechanical Contractor: R. M. Wells—Quanah, Texas

The twelve buildings of this campus-type high school are heated and cooled with water. The pumping equipment consists of six B&G Universals, twelve Series 1510-B pumps and eight Boosters.

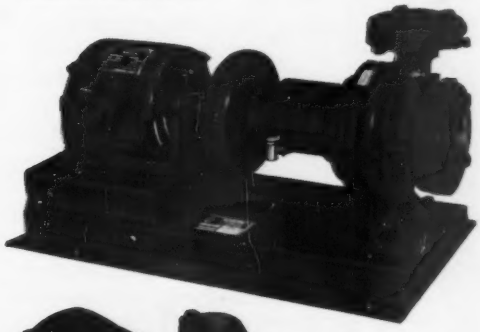
These pumps circulate single and dual coil units for heating and cooling and also the service water lines. Pump sizes range from 1/6 HP Boosters to 20 HP Universals.

To keep pumping horsepower at a minimum, a B&G primary and secondary pumping arrangement is employed, with the piping divided into three primary circuits. Each primary pump is sized to circulate the maximum demand for water through a single loop. The pump, therefore, need only be large enough to overcome the friction head in the primary piping circuit.

Secondary pumps in each building, and for each major zone in each building, handle water quantities out of these main circuits and overcome the balance of the head in the system.

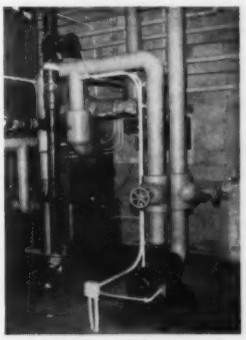


Two B&G Pumps for circulating chilled water



B&G Universal Pump

B&G Booster



B&G Universal Pump for circulating heated water through primary circuit

B&G Booster circulating one of the secondary circuits

BELL & GOSSETT
COMPANY
Dept. GA-70, Morton Grove, Ill.
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

firms is much appreciated, and recently published accounts of the solutions our colleagues on the other side of the Atlantic have found to their housing problems are studied with great interest. Many of the fast-growing Swedish firms, with their staff spread in premises over large city areas, are actually planning to build offices of their own, and new ideas regarding their general layout, furnishing, and office equipment are eagerly received.

To those of our members who have works abroad and who in a general way are interested in international cooperation between consultants – and their number is increasing – all your articles concerning FIDIC, regarding the American consulting engineers' organizations, and the endeavors to unify them into one organization, are of special interest. The recent election of the Consulting Engineers Council as a member of FIDIC is much appreciated in this country, and we have noted with satisfaction the positive attitude CONSULTING ENGINEER has taken to this question.

Whenever consulting engineers from different parts of the world meet, it soon becomes apparent that there is a special group of problems which confront the practicing engineer everywhere. Thus, the problem of competition from contractors, with their "free-of-charge" proposals, and from engineers in state and municipal employ, who use their spare time to compete with the professional man and who, in their salaried position, can underbid him as regards fees, seems to be quite universal.

Besides all editorial text, the magazine contains numerous advertisements, many of which are certainly studied with a more than usual interest by your readers abroad. Taken together, they give a good view of new developments in the various fields of engineering activity within your country and new ideas of possible solutions to the reader's actual problems. The Directory of Advertisers' Literature is useful in this respect for the man who wants information.

Finally, I wish to congratulate you on the attractive appearance and typographical presentation of the magazine, the December issue of which I am now looking forward to receiving.

Valter Furuskog, Chairman
Swedish Association of
Consulting Engineers
Stockholm, Sweden

Improving Equipment Catalogs

Sir:

Now that Lennox has completed the job of compiling a comprehensive engineering handbook, I wanted to write you personally and tell you that your Committee of One-Hundred reports on what kind of technical data engineers want were the most helpful information we had received for doing this job. We thoroughly researched the problem before starting on the project, including a study of other manufacturers' publication methods and contacting other publishers for their advice.

I would not hesitate to recommend to any other manufacturer that the studies of your Committee of One-Hundred will give them the simplest, most clearcut blueprint for presenting engineering data for the engineering profession.

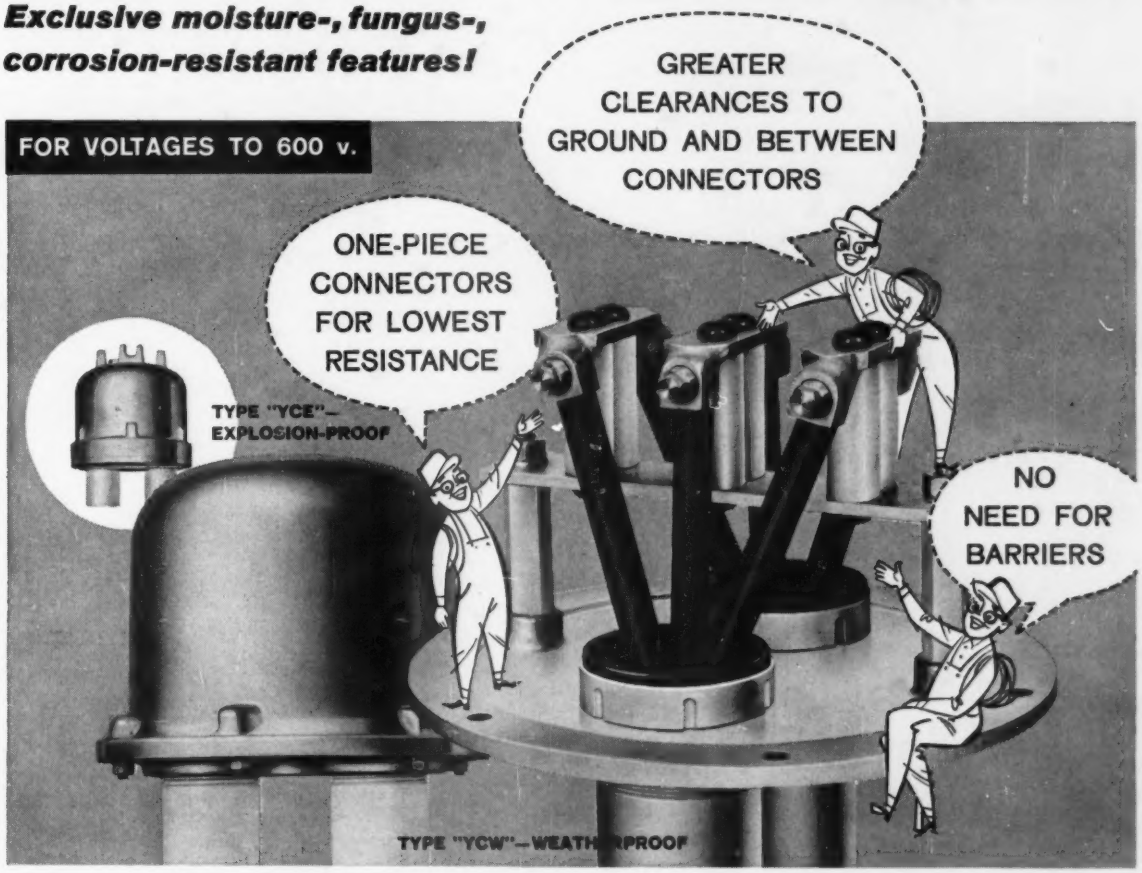
Many thanks for making this information available to us.

Since releasing this comprehensive publication to our sales organization, we have placed more than 7000 editions among Lennox dealers and consulting engineers. The reception from consulting engineers has been above our expectations. They report that it is the best presentation of engineering facts on a manufacturer's line of equipment that they have yet seen.

Roger C. Lakey
Special Representative
Lennox Industries, Inc.
Marshalltown, Iowa

NEW! O.Z. PULL-N-SPLICE BOXES!
CONVENIENT·COMPACT·ECONOMICAL

Exclusive moisture-, fungus-, corrosion-resistant features!



O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

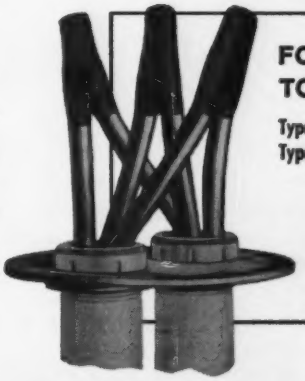
Their highly compact size saves *more space than ever!*

Their more efficient design means *new savings in installation time and labor!*

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are *smaller* — and *cost far less* than conventional pull boxes . . . even late model *competitive* types! And, you get a bonus in high quality materials and workmanship so characteristic of *all* O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.



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Type "YPE" — Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.

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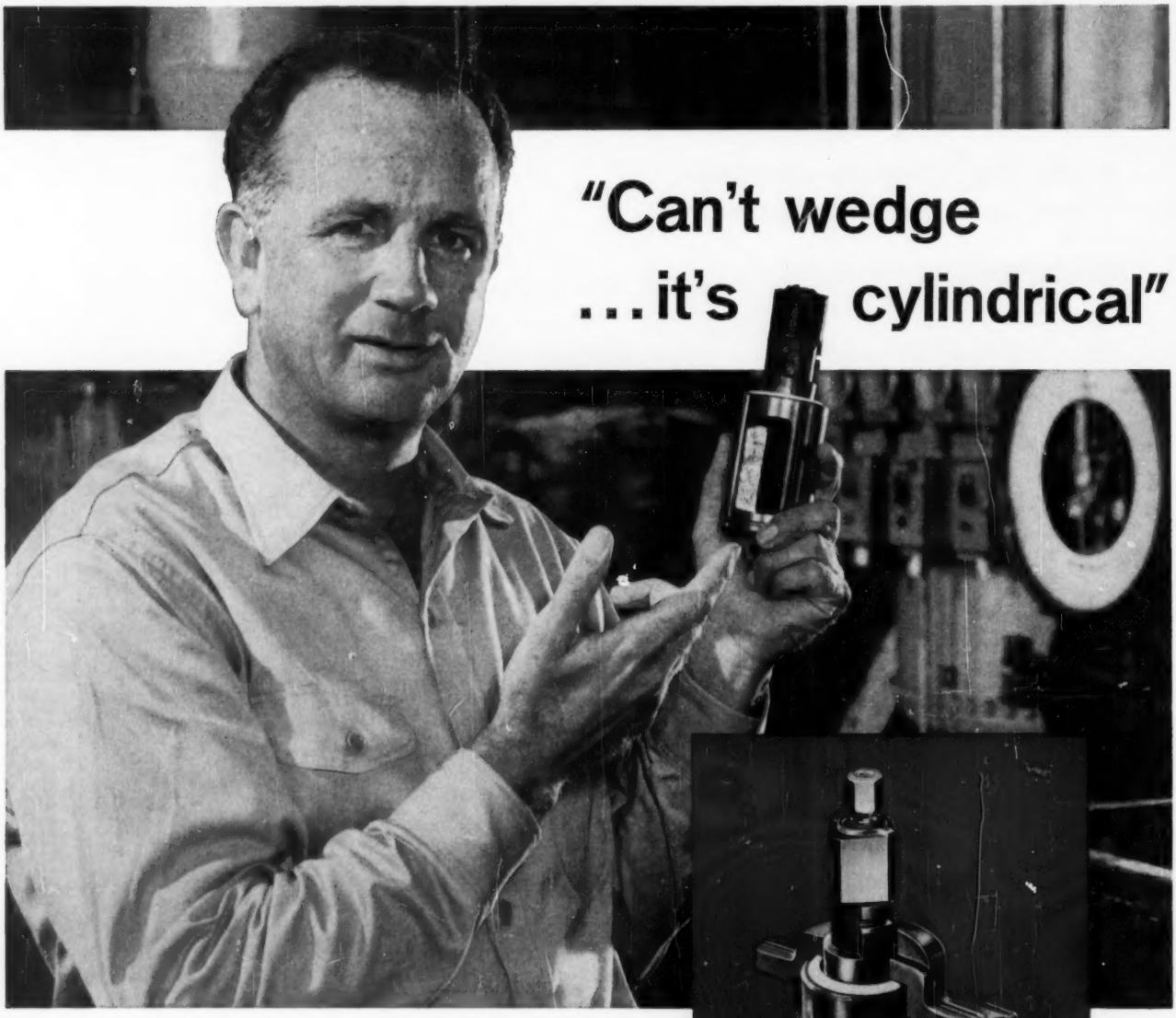

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WRITE FOR CATALOG 400

W-K-M

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Sizes: ½" through 30".

Working Pressures: 125 through 800 pounds.

PRODUCT OF W-K-M's
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5910-R

measure Roebling's "Bridge-Ability"

Shown here is the new Kishwaukee River Bridge at Seth B. Atwood Park, New Milford, Illinois. It was designed, furnished and erected by the Wisconsin Bridge & Iron Company, Milwaukee, Wisconsin. Its main cables are Roebling 1⅛" prestretched, galvanized bridge strand.

This structure is an excellent example of the scope of Roebling's Bridge Division activities, whether it be large or small—design, erection or, as in this instance, supplying the cables.

Doubtless, you don't have a "Golden Gate" to bridge at the moment. You may, though, have a pedestrian handling problem in your plant, a materials-handling problem *anywhere*. It is important to remember that Roebling's familiarity and experience with suspension systems of *any* description puts us in the unique position of being fully able to help you solve problems along these lines. We welcome inquiries touching on any phase of suspension by wire rope or strand. Just ask Roebling's Bridge Division, Trenton 2, New Jersey.

by the mile
(Golden Gate Bridge)

by the foot
(Kishwaukee Bridge)

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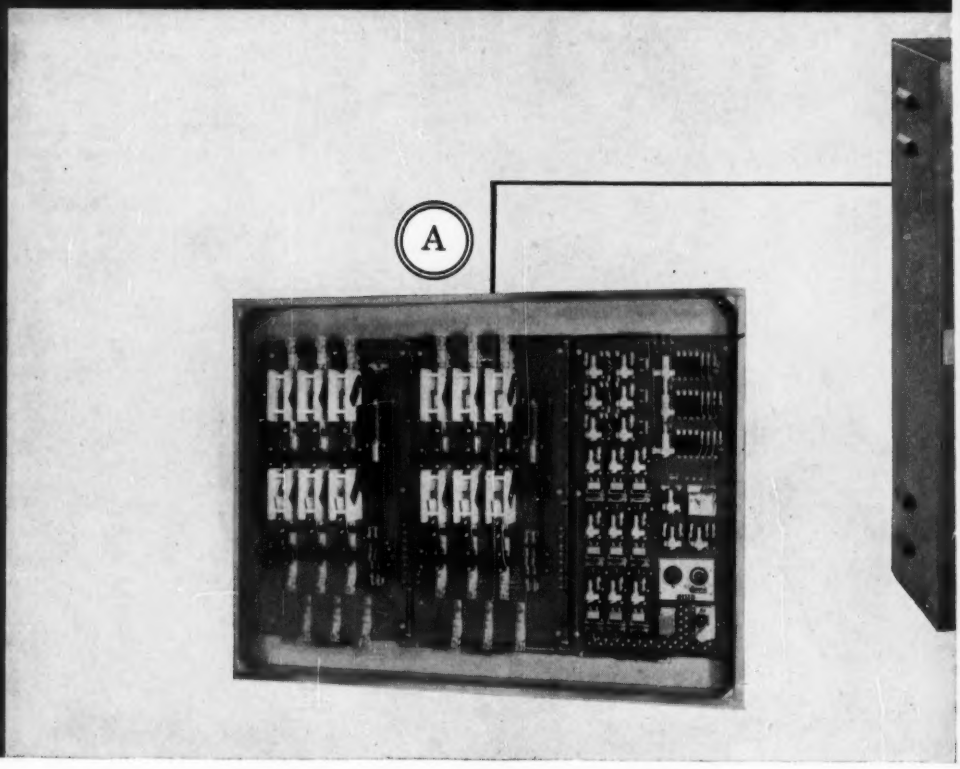
WHEN POWER

ASCO COMPLETE CONTROL SYSTEMS PUT



Here's how ASCO control system operates . . .

ASCO Automatic Transfer Switches, with built in selected time delay of ½ to 3 seconds, ignore momentary outages caused by transient conditions—thus protect generating equipment from false starts. However, once a sustained outage is detected, ASCO Control Systems put standby power in action—fast. Follow the cycle, step by step . . .

STEP 1 The instant a sustained outage is detected, a contact on the ASCO Automatic Transfer Switch (A) closes.

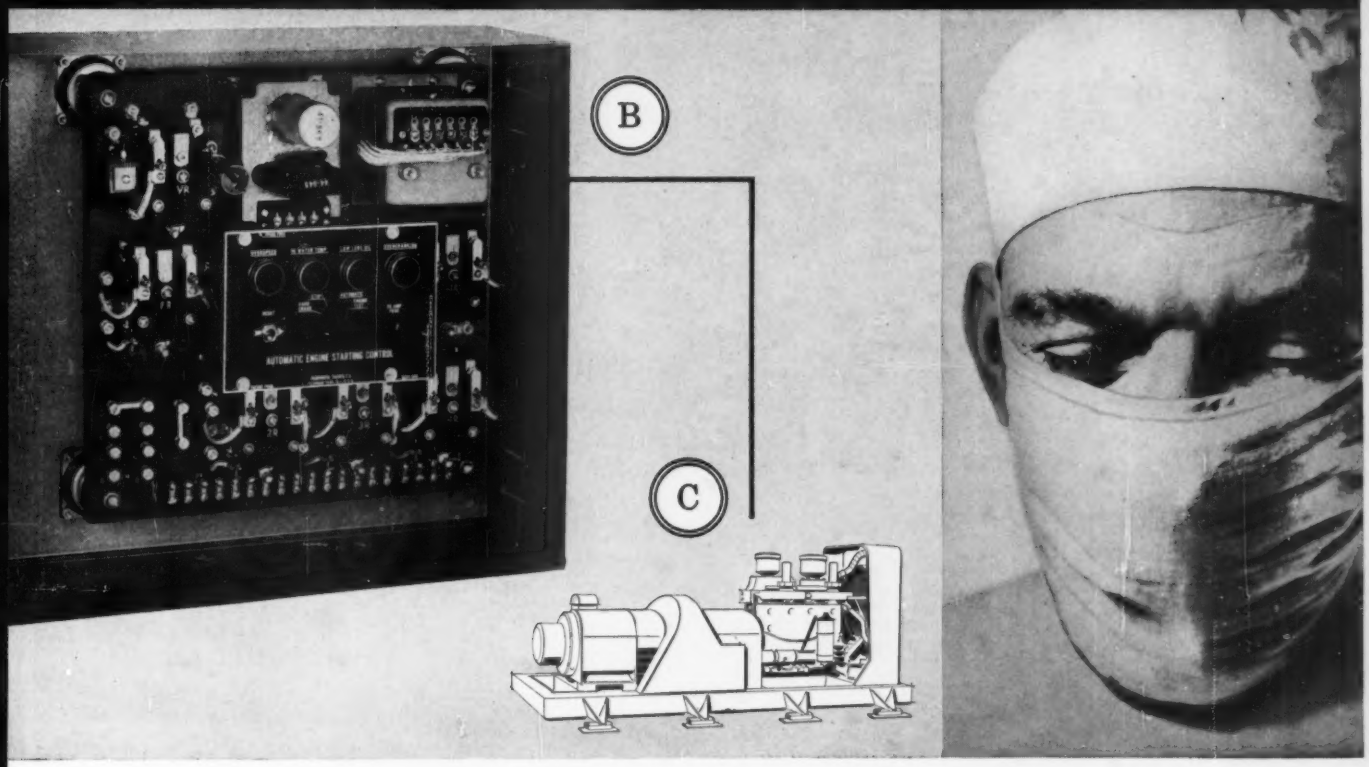
STEP 2 This energizes the ASCO Automatic Engine Starting Control (B), which opens the fuel control device on the generator and cuts in batteries to energize the starting motor and crank the engine (C).

Four on-off cranking cycles are provided. When the engine fires, the starting control automatically disconnects the cranking control.

STEP 3 When standby power source reaches proper voltage and frequency, the transfer switch transfers the load to the electric plant. Time of transfer —1/30 to 1/6 of a second!

When normal power is restored, the ASCO Transfer Switch returns the load to its original feeder lines. The Starting Control then causes the electric plant to shut down.

STANDBY POWER IN ACTION – FAST



For Dependable Standby Power, ASCO designs and manufactures a complete line of emergency power and electric plant control equipment. In addition to Automatic Transfer Switches and Automatic Engine Starting Controls, this includes:

Solenoid Valves: For air starting applications, and for controlling the flow of cooling water, fuel oil and other liquids and gases.

Battery Chargers: To keep starting batteries charged, ready for engine starting.

Solenoids: For fuel control devices, operating shutters for engine cooling, and other electric plant applications.

Load Demand Controls: To automatically start engine when load is applied; stop it when load is removed.

For Detailed Information write for:

Catalog 57-S1 – Automatic Transfer Switches

Catalog 57-S5 – Solenoids

Catalog 57-S6 – Electric Plant Controls (including battery chargers)

Catalog No. 25 – Solenoid Valves

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ASCO Electromagnetic Control

Automatic Switch Co. 50-CC HANOVER RD., FLORHAM PARK, N. J., FRONTIER 7-4600

AUTOMATIC TRANSFER SWITCHES • SOLENOID VALVES • ELECTROMAGNETIC CONTROL

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From the Editor's

Tranquil Tower

What is a consulting engineer?

JUST WHAT IS a consulting engineer? The dictionary is of no help; there are no legal definitions; and as pointed out in the article, "Portrait of the Man at the Top" (page 88), neither the public nor the consulting engineer himself seems to have any clear image of the profession or its practitioners.

This is not as it should be. Any trade or profession should have a reasonably good idea of who fits its mold and who does not. It can be assumed that plumbers know a plumber when they see one. Much the same can be said of file clerks, farmers, and attorneys — but no one can define "consulting engineer."

There have been some efforts. The Consulting Engineers Council took a healthy swing at it a couple of years ago and fanned out. They came up with this —

"A Consulting Engineer is a professional engineer who offers his services on a fee basis and who has no commercial affiliation to bias him. He is trained in expert and judicious application of science and technology to the solution of engineering problems, and is one, who, through special application, broad experience, proven ability, and professional integrity, provides his client with technical advice of the highest quality in the fields where he practices as an expert."

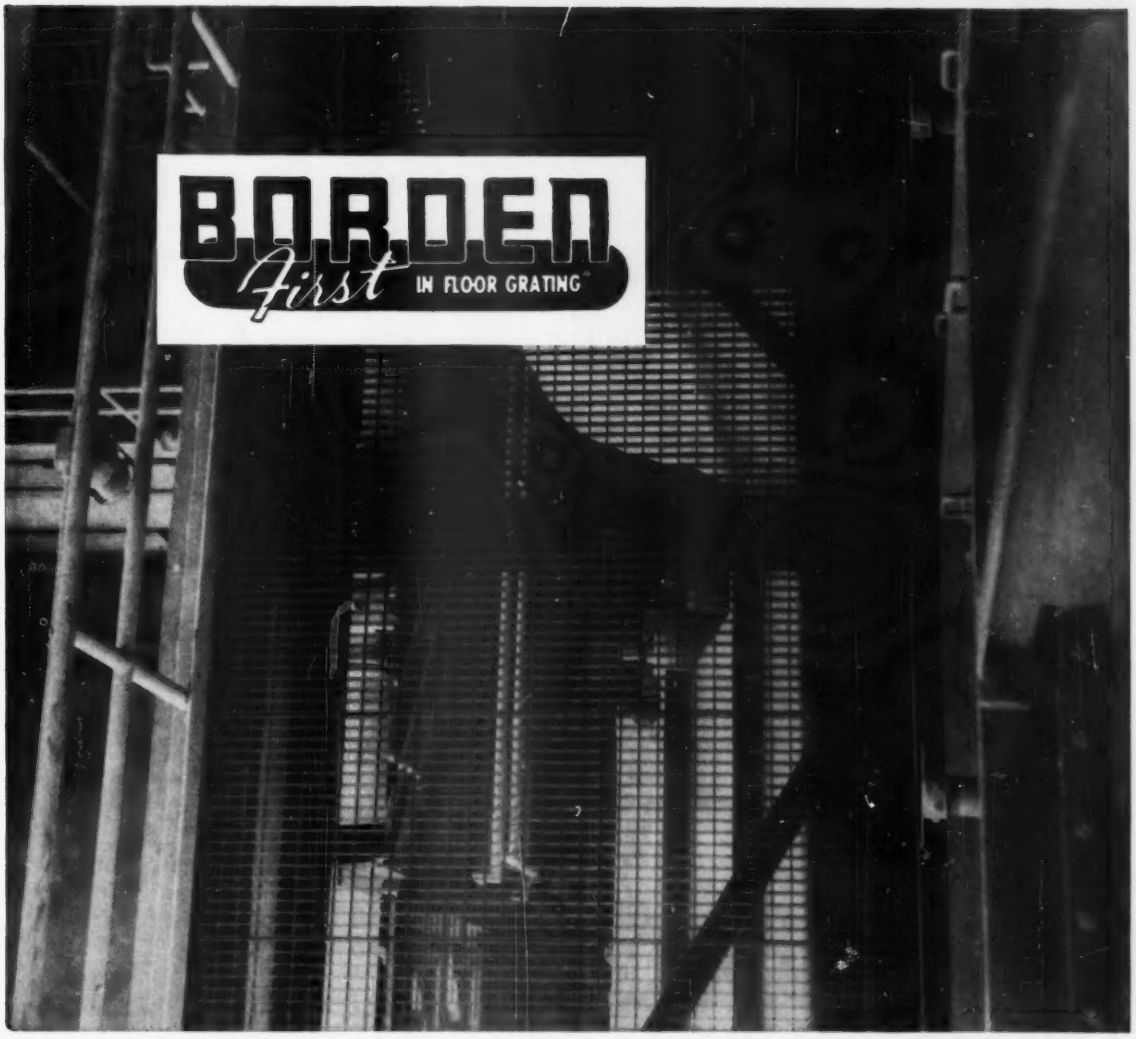
Overlooking the questionable usage, the unusual punctuation, and the addition to cliches, the definition still is little more than a sort of pretentious creed combined with some self-laudatory advertising. It starts off as though it were going to be a definition, and the first sentence, while weak, is not bad as a start, but from there on, it is an attempt to describe a technical Sir Galahad. It sets a goal; it describes an ideal; but surely no one believes that every consulting engineer must meet these specifications. And just who is to decide the exact meaning of "judicious," "special," "broad," "proven," "highest quality," and "expert." All of these are words that in themselves defy exact definition and therefore are worthless in writing exact definitions. "Professional," a term as hard to define as "consulting engineer," is used twice, each time with a different meaning. In the first sentence it is used to mean a registered engineer, a P. E. Later it is used as an adjective to modify "integrity," and here it is supposed to denote relation to a respected profession — as opposed to some crass commercial business or some lowly trade.

Even the first sentence can be picked apart. It says that the consulting engineer "has no *commercial* affiliation to bias him." Is this to imply that it is permissible for him to have a *noncommercial* affiliation to bias him? We would rather he not be biased at all.

This definition is, then, inaccurate, vague, and pedantic to boot. Yet it should not be condemned without a plea for mercy, for it is hard to prepare a definition that is accurate, pointed, and plain. Still, if we are nearly so wise and worthy as the Council definition demands, the difficulty of the task should not deter us. Let us at it!

First, we should try to get some idea of the extent of the task. What we want is a definition of "Consulting Engineer." It should not describe an ideal; it should have nothing to do with whether the consulting engineer is a good consulting engineer or a lousy one. That is not the point. When we define "lawyer," the definition includes both the most ethical attorney and the lowest shyster accepted before the bar. Both are lawyers. Similarly, the definition we are after has nothing to do with the quality of the consulting engineer's work or his virtues or his vices. It should comprehend both the good and the bad so long as each is legally allowed to practice.

There are, however, detailed yet important speci-



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fications that must be carefully written. For example, where do the constructors fit? Is there anyone at Stone and Webster who can properly call himself a consulting engineer? At Kaiser Engineers? At Austin Company? If so, how should the definition be written to include these engineers while eliminating contractors who are strictly contractors but also happen to be registered engineers? How about professors who design for a fee; are they consulting engineers who teach; or are they professors during the day, shedding their academic gowns at night to become consulting engineers — sundowners, as some would have it.

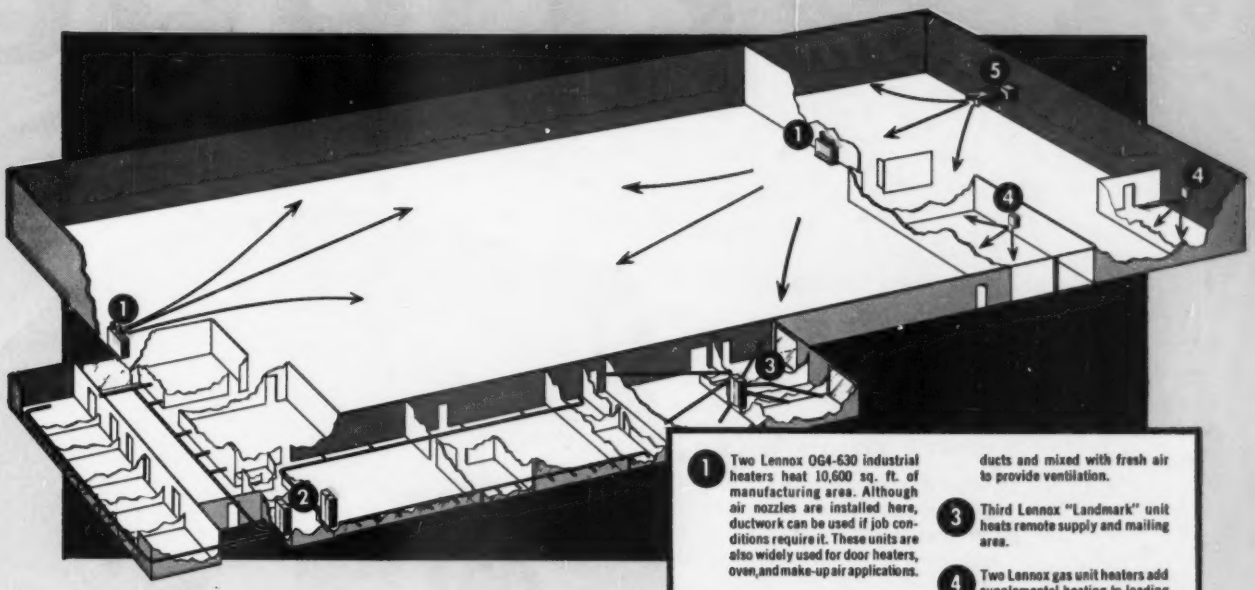
Then there is the problem of deciding who within even the pure, independent, lily-white consulting firm is to be properly termed a consulting engineer. We might all agree that the partners are consulting engineers, but how about the project engineers, the chief engineers, and the other responsible (in the sense that word is used by the Founder Societies) engineers? Are they consulting engineers or are they simply employees of consulting firms? How about the president of an organization that practices as a corporation? He is the top man, and he may own almost all the stock, but he still is an employee. As such, can he be called a consulting engineer?

It is even necessary to be careful about reference to registration, for California still does not require registration for any but civil and structural engineers offering services to the public, and surely a general requirement for registration could not be included, for many countries that do have consulting engineers do not have registration laws.

It is clear, then, that the defining of "consulting engineer" is not easy. But it is a task that needs to be done. Until the term is clearly and correctly defined, there is going to be reoccurring difficulty in legal matters; in establishing qualifications for membership in consulting engineer associations and functional groups; and in being sure that clients in particular and the public in general can build up an accurate, focused image of the practitioners and the profession. ▲▲

A TYPICAL INSTALLATION:

HOW *LENNOX* SOLVES INDUSTRY'S HEATING PROBLEMS



1. Two Lennox OG4-630 industrial heaters heat 10,600 sq. ft. of manufacturing area. Although air nozzles are installed here, ductwork can be used if job conditions require it. These units are also widely used for door heaters, oven, and make-up air applications.
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• You can well understand why John Erhart, Cincinnati Shaper's head electrical engineer, "points with pride" as he and Square D field engineer Dale Calender make an inspection of the new plant's electrical system. "For," as Chief Engineer Erhart explains, "we use electricity for much more than the usual lighting and power jobs."

Square D, also, "points with pride" to the array of electrical distribution and control equipment which is on duty throughout this unusually efficient plant—and to the thousands of Cincinnati Shaper machine tools into which Square D controls have been built over a period of many years.

FIELD ENGINEERING SERVICE is available to architects and consulting engineers through more than 100 Square D offices, backed by 1000 authorized electrical distributors and 19 plants in the United States, Canada, Mexico and Great Britain

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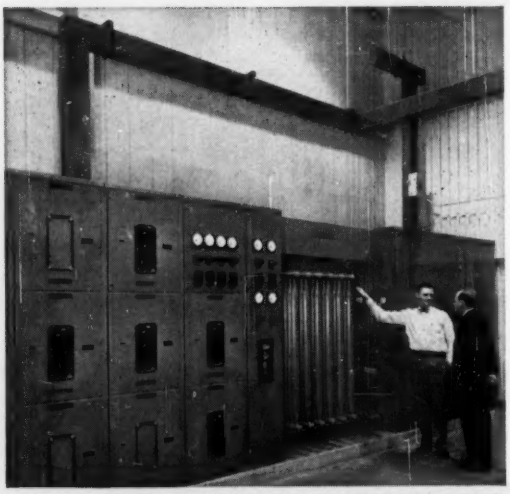
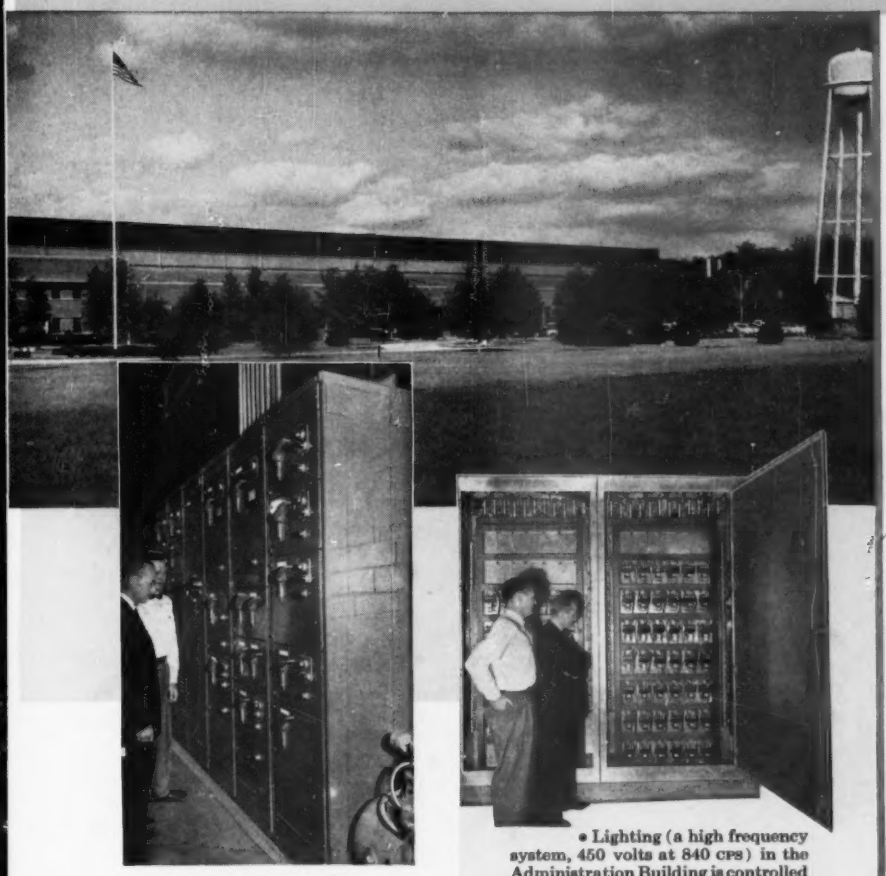


• Shown above is one-half of a Square D double-ended unit substation which feeds several runs of Square D plug-in duct. Notice the "T" in the duct installation which makes it easy to extend the bus run for future bus tie connection.

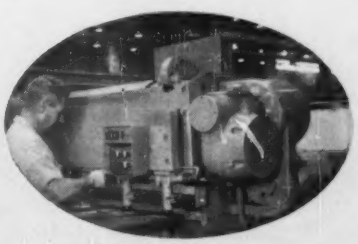
SQUARE D COMPANY

electricity is distributed and controlled



• This Square D control center in the Administration Building includes circuit breaker combination motor starters for the heat pump and air-handling equipment. Heat pump operation is automatically controlled through thermostats and programmed by clock system.

• Lighting (a high frequency system, 450 volts at 840 CPS) in the Administration Building is controlled from this panel. Note space for future additions of Square D contactors as they're needed.



• You'll find Square D controls on a lot of the machine tools which roll off Cincinnati Shaper's production lines. Above, Square D pushbuttons being installed on a power squaring shear.

• Square D circuit breaker panelboards are installed throughout the plant. Breakers in upper half are for light switching; those in lower half for receptacles, emergency lights, drinking fountains, etc. Lockable, two-door arrangement prevents inadvertent switching of lower units.

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PRESS CONTROL
PRESSURE, FLOAT, & VACUUM SWITCHES
PUSHBUTTONS
RELAYS AND CONTACTORS
RESISTORS
SAFETY SWITCHES
SERVICE ENTRANCE EQUIPMENT
STAGE DIMMERBOARDS
STEEL MILL CONTROL
SWITCHGEAR & UNIT SUBSTATIONS
SYNCHRONOUS MOTOR CONTROL
TERMINAL BLOCKS
TEXTILE MACHINE CONTROL
TIMERS
VOLTAGE TESTERS
WELDER CONTROL

Presenting Our Authors

Dr. Jules Backman's economic forecast (page 96) is the second he has done for CONSULTING ENGINEER. Standing on his past record, it should be a good and true one which our readers would do well to heed. Certainly Dr. Backman is well qualified for the task. He has been an economic adviser to the railroad and steel industries since 1944, specializing in wage and rate disputes. Industry in general has sought him out as both adviser and speaker, and in addition to being a professor of economics at New York University, he is an editorial writer for the *New York Times*.

Kenneth W. Malach graduated from Stevens Institute of Technology with an M. E. degree in 1944, just in time to spend two years with the U. S. Navy Air Corps. His article on automatic backwash for water filtration plants (page 102) is the result of his increasing responsibility in supervising the preparation of plans and specifications for the mechanical phases of this and similar types of projects. Malach is a project engineer with Whitman, Requardt and Associates, Baltimore consulting engineers, and has been with the firm since 1946. He is a member of ASME and has been active in the Baltimore Section.

John N. Richards, as a second term president of the AIA, can speak with some authority on "Getting Along Professionally" (page 108). He is a native of Toledo, Ohio, who returned to his home town only after earning a Bachelor of Architecture degree from the University of Pennsylvania, traveling and studying abroad, and working with several Philadelphia architectural firms. He became a Fellow in the AIA in 1954, was elected president in 1958, and re-elected last June in New Orleans. As chairman of the Pedestrian Malls Committee, in Toledo, he is deeply involved in a program that may relieve American Cities of their downtown blight.

James Kip Finch carries on with his popular series on the great books of engineering (page 112). As Dean Emeritus, Columbia University, he has converted an avocation in engineering history into a vocation that might well be a full time job for many a faculty member. In addition to his writing for CONSULTING ENGINEER, Dr. Finch has written for *Civil Engineering*, is finishing up a book on the history of engineering, and writes the engineering biographies and other sections on engineering for Americana and Brittanica Encyclopedias.

Charles T. Chave returns to CONSULTING ENGINEER with a realistic appraisal of the economics of nuclear power (page 92). This time he is a hard headed engineer — last time a philosopher ("What Ethics?", October 1958, page 88). As chief engineer of Stone & Webster Engineering Corporation's Nuclear Projects Division, Chave has managed to keep his engineering interests well stimulated. His technical and professional interests keep him busy on an after hours program of civic and educational activities in ECPD, ASME, AIChE, and NSPE. Chave is a mechanical engineering graduate from Columbia University, and a registered engineer in seven states. ▲▲

Factory assembled models from 50 to 150 tons cooling, up to 1200 MBH heating at 0°F. Larger, field assembled systems to meet your requirements.

YORK Compound Air Source Heat Pump can heat and cool simultaneously!

Cools one side of building... uses rejected heat to warm the other side!

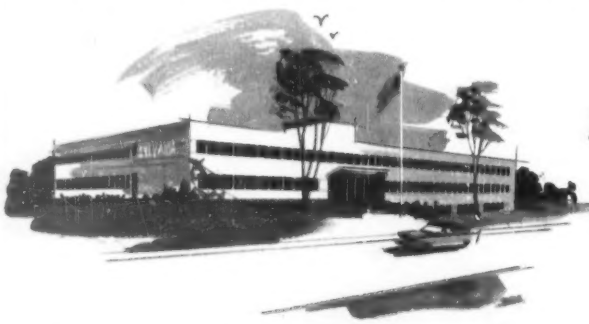
Because of wide variations in solar and internal heat loads, multi-story buildings require heating *and* cooling at the same time almost all year around. York's air source heat pump which can heat and cool simultaneously is the ideal answer for such a situation.

The York Heat Pump can take heat from the sunny side of the building where cooling is needed, and move this heat to the shady side where warmth is needed. Or this advanced York system can take heat from any area to be cooled, such as a data processing machine room or telephone exchange, and move it to any area needing warmth.

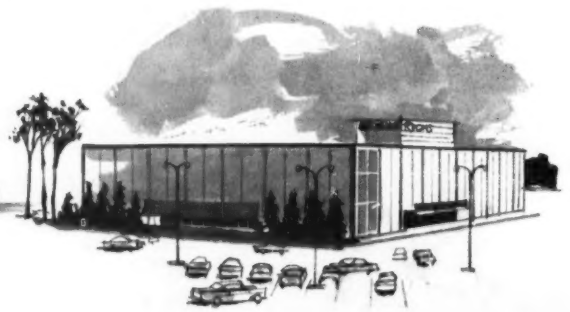
In this way, the York Heat Pump delivers 66⅔% of the heat absolutely free. For every kilowatt of electric power that's put into the system, *three* kilowatts worth of heat come out. The free heat comes from such sources as outside air, rejected heat from cooling, waste heat from processing, etc.

The York Heat Pump with exclusive compound compression can wring heat from −10°F. air, making it applicable for year around heating and cooling in any part of the U.S. No supplemental electric strip heating is required. The compound design produces up to 67% more heat than a single stage system from the same electric power. York Heat Pumps can be completely factory assembled and tested for simple, low cost installation, and absolutely dependable operation.

YORK Air Source Heat Pumps in Action at...



SYLVANIA LABORATORY, AMHERST, N.Y., uses a York Heat Pump to heat and cool the 85,000 sq. ft., 2½ story building. System delivers 250 tons of cooling in summer and 2400 MBH heating in winter to York perimeter fan-coil units.



RICH'S DEPT. STORE, ATLANTA, GA., in the huge, modern Lenox Square Shopping Center, is heated and cooled by a York compound air source heat pump. Cooling capacity is 820 tons and the heating capacity is 3400 MBH.

YORK
3-Pipe Hi-I Induction System makes both heating and cooling continuously available at each unit!

Gives instant response and slashes operating costs!

Multi-room buildings often require heating for some spaces and cooling for others simultaneously. Up to now this has been done in one of two ways: 1) Double duct systems with a warm and cold air stream that is blended at the air outlet to provide desired room temperature, or 2) Conventional induction systems that deliver warm ventilating air while circulating a variable quantity of cold water. Either method achieves control in the conditioned space by consuming both heating and cooling energy simultaneously.

York's 3-pipe system provides either heating or cooling at any time without wasteful mixing. Both hot and cold water are piped to each unit. A York-conceived automatic 3-way non-mixing control valve selects one or the other and modulates flow to provide desired temperature. If neither heating or cooling is needed, water shuts off.

Some like it hot, some like it cold. Having heating and cooling capacity always available at each unit permits wider temperature variation from room to room, and gives instant response to changes in load or thermostat setting. Assures highest level of personalized comfort ever offered!

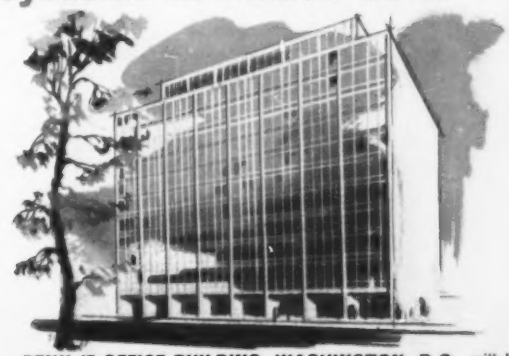
Simplicity of York system means substantial savings in operating costs, low initial cost and reduced space needs. Added cost of the third pipe is offset by eliminating change-over problems, reheat coils, duplicate zoning equipment, simplifying air distribution and control systems.

York offers a choice of 30 different models of induction units to match any application.

York automatic non-mixing 3-way control valve—heart of the 3-pipe system.

YORK 3-Pipe Hi-I Induction Systems in Action at...

STATLER-HILTON HOTEL, BOSTON, delivers instant comfort to 1300 guest rooms with York 3-pipe system. Using existing steam, turbine-driven centrifugal and steam-powered absorption water chillers economically provide 812 tons cooling.



PENN 17 OFFICE BUILDING, WASHINGTON, D.C., will be heated and cooled with a York 3-pipe peripheral system consisting of 550 Hi-I Induction units. Two York Turbo pak water chillers will supply approximately 650 tons refrigeration.

Capacities from 100 to 740 tons refrigeration

YORK Lithium Bromide Absorption System Cools with Steam or Hot Water!

Uses less pump horsepower per ton of cooling!

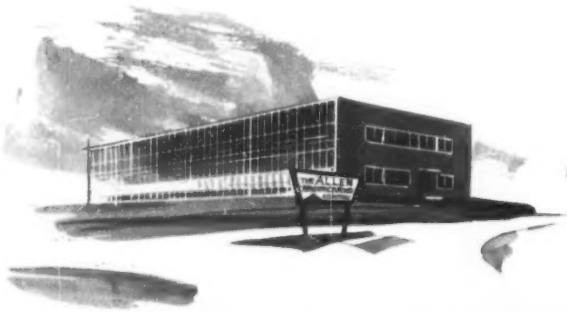
Here is a unique system that can use an existing steam supply, either from boilers or district steam companies, to provide chilled water for comfort or process cooling. This means significant savings in operating costs over motor-driven compressor systems. Hot water or process fluids can also be used as the heat source.

York's Absorption System is virtually maintenance-free. Except for 3 small pumps and motors, it has no moving parts. The absence of major moving parts insures extremely quiet, vibration-free operation. This permits installation anywhere from basement to roof without special foundations or sound deadeners.

Installation costs are cut by eliminating large expensive starters and heavy electrical conduit. System operation is automatic and completely flexible, easily handling all load changes from overload down to zero.

In the York Absorption System, plain water is the refrigerant and lithium bromide, a simple salt, is the absorbent. Both these fluids are non-toxic and non-explosive, and never need replacement once charged into the system. York's advanced fluid distribution method assures quieter operation, rapid start-up and close control. A steam valve provides simple, direct capacity control.

YORK Lithium Bromide Absorption Systems In Action At...



ALLEN MFG. CO., BLOOMFIELD, CONN., uses their excess boiler capacity in summer to provide cooling. A 230-ton York Absorption System air conditions the office and cafeteria and a 170-ton unit chills process water for plant usage.

CARSON PIRIE SCOTT & CO., CHICAGO, ILL., uses a 200-ton York Absorption System to cool 120,000 sq. ft. of office, cafeteria and retail sales space in their 11-acre warehouse building. They expect 25% savings in operating costs.

TISHMAN BUILDING, BUFFALO, N.Y., has a 530-ton York Absorption System supplying cooling to a York Induction Air Conditioning System. The entire refrigeration and heating plant is located on the roof of the 20-story building.

YORK Turbopak World's First Packaged Hermetic Centrifugal Water Chiller!

Takes 50% less space!

York's Hermetic Turbopak is a full 50% smaller than previous models, saving valuable floor space and enabling installation in confined or non-productive areas. Secret of the unit's amazing compactness is the exclusive York Borg-Warner power transmission, which permits a 50% reduction in the size of the compressor rotor.

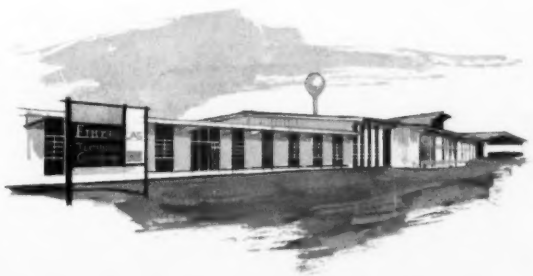
To save on installation costs, the Turbopak is completely factory assembled and insulated. It is shipped and rigged as a single unit. There's no time-consuming aligning or refrigeration piping required on the job, just simple water and power connections.

The York Turbopak is exceptionally quiet and vibration-free, permitting it to be located anywhere in the building that's convenient. The system is automatically controlled from an attractively styled, centrally located panel that is factory wired and mounted on the unit.

Efficient capacity reduction from 100% down to 5% is made possible by pre-rotation vanes. This automatic, continuously variable control method, introduced by York, gears refrigeration capacity directly to air conditioning load.

Capacities from 65 tons refrigeration

YORK Turbopak Water Chillers In Action At...



OWENS-CORNING FIBERGLAS CORP., GRANVILLE, O., requires precise temperature-humidity control and clean, dust-free atmosphere for this research and testing facility. Two 200 horsepower York Hermetic Turbopaks do the job.

ILLINOIS POWER CO., DECATUR, ILL., installed a 100 horsepower Turbopak for air conditioning their 2-story office building. Unit's compactness enabled location in space previously wasted. Expect to save 15% in maintenance.

INSURANCE COMPANY OF NORTH AMERICA, RICHMOND, IND., makes use of a 125 horsepower York Hermetic Turbopak to air condition their modernized office building, greatly increasing the comfort and efficiency of the employees.

New Plus New

Complete YORK Line of Central

EXACTLY MATCHED TO OTHER YORK

Wide Line—New fan-coil units from 800 to 36,000 cfm are design-matched to York cooling equipment to give a complete, balanced system. Units cool, heat, humidify, dehumidify, mix, filter and circulate the air for complete human comfort.

Maximum Flexibility—Modular construction gives design flexibility, cuts installation costs. Fan section rotates for air discharge in 3 directions. Coil section accommodates almost any combination of cooling, preheat and reheat coils.

Long Life Built In—Rigid frame angle construction completely galvanized for corrosion protection. Fans double-protected with epon coating baked over galvanized finish. Fan bearings permanently life-time lubricated for dependability.

Quiet Operation—Evase connection between fan outlet and unit outlet insures maximum efficiency at lowest noise level. Fans have forward-curved blades for low speed, low outlet velocity operation to assure quietness. Panels sound-insulated.

Modular d
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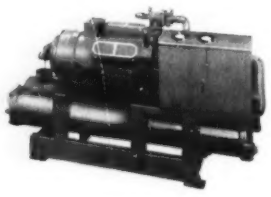
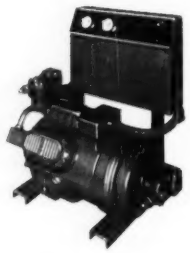
includes a

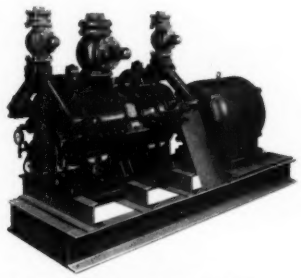
Range of Equipment and Servic



PACKAGED WATER CHILLERS. Widest range of models, including a new dry-expansion line, to meet any application. Take 20% less floor space. 3 to 300 tons.



HERMETIC COMPRESSORS. Deliver more capacity per foot of installation space. Largest model takes only 7 sq. ft. of floor area. 10 to 45 tons refrigeration.



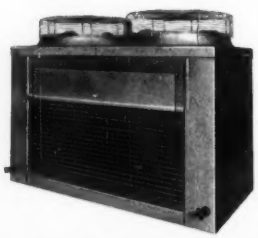
V/W COMPRESSORS. Halocarbon or Ammonia, up to 300 tons. Automatic unloading down to 25% capacity with power savings in almost direct proportion to load.

HYDRALINE. Attract
recessed fan-coil units a
ton factory packag
chillers for hydronic he
air conditioning systems

Expanded YORK Line of Packag

FOR COMMERCIAL APPLICATIONS

Embassy water-cooled models with step-capacity design cut operating costs up to 15%. Cool a room or a building. 3 to 33 tons.



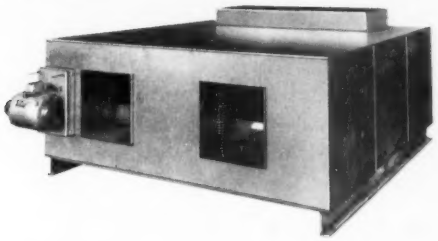
Champion air-cooled models eliminate costly water towers and connections. Install quickly and easily. 10 to 22½ tons capacity.

Heat Pumps heat and cool, have exclusive electric defrosting. Completely factory assembled and wired for fast installation.

Comfort Center heats
humidifies and deh
purifies air electronical
compact, attractively

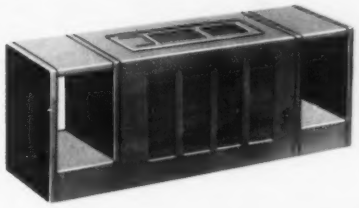
ral-Station Air Conditioning Units

ORK EQUIPMENT TO GIVE YOU AN EFFICIENT, WELL-BALANCED SYSTEM

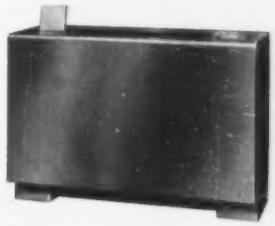


odular design of this new line of York central fan-coil units provides unusual design
d installation flexibility. Unit sections can be arranged horizontally or vertically,
d either ceiling or floor mounted, to best utilize the space available. New line
cludes a wide choice of accessory equipment to meet individual requirements.

Plus **THESE ADVANCE DESIGN AIR HANDLING UNITS**



Hi-I Induction Air Conditioners in wall or floor models with 30 capacity sizes. High efficiency plenum and nozzle design improves air circulation, boosts capacity per cfm of primary air.



Fan-Coil Air Conditioners can supply year around heating and cooling without primary air equipment and ducts. Complete range of floor, wall and ceiling models for any application.

ice to Meet Your Specific Requirements

Attractive, semi-
il units and 3 to 15
ackaged water
ronic heating and
systems.

ECONOMIZERS. Wide choice of evaporative condensers to save water and power. Sectional construction for installation ease and flexibility. Built to last.

ICE-MAKING EQUIPMENT. Saves cost of delivered ice, pays for itself. Automatic, factory packaged units with ice-making capacities from 100 lbs. to 12 tons.

Fast Service from a Nationwide Network of

YORK PARTS DEPOTS

Strategically-located warehouses give fast, localized service on genuine York renewal parts, valves, fittings and oil. Helps minimize equipment downtime.

Continuous Peak Performance of Your Air-Conditioning System Assured by

YORK Certified Maintenance

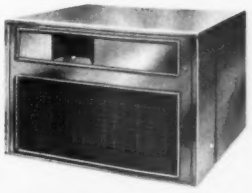
Covers regular inspections, emergency service, complete maintenance including parts and labor, change-over or start-up and shut-down for a nominal, agreed-on-in-advance fee.

aged Air Conditioning

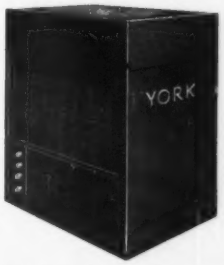
FOR RESIDENTIAL APPLICATIONS

r heats and cools,
nd dehumidifies,
tronically, all in one
ctively styled unit.

Heat Pumps heat and cool electrically, eliminate chimneys and fuel handling. Self-contained unit installs almost anywhere.

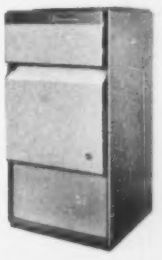


Pathfinder self-contained air conditioners cool a whole house, need no water. Locate anywhere there is access to outside air.



"Add-On" air conditioning units bring cooling economically to warm air heating systems, or install as a separate system.

Room Air Conditioners deliver powerful-quiet cooling. Three beautifully styled series, including year-round heat pump models.



Gas or Oil fired furnaces have Silver "V" burners that deliver more heat, more economically. Complete range of types and sizes.

YORK®

Creative engineering opens the way to increased comfort and productivity...

"I can press a button and ripen an acre of fruit... reduce clerical errors... give 3,000 people a good night's sleep"

Wherever People LIVE...

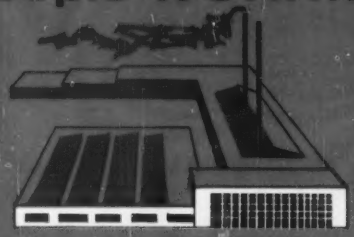
HOMES—York helps families live better, eat better, sleep better in cool, clean, more healthful comfort.

APARTMENTS—York makes them quieter and more comfortable to live in, and much easier to rent.

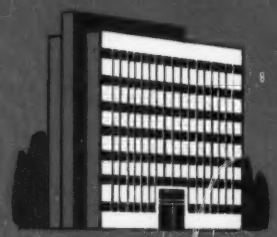
HOTELS and MOTELS York keeps rentals competitive, helps assure full occupancy all year around.

Wherever People WORK...

STORES—York helps attract more customers, keeps them longer and puts them in a buying mood.



FACTORIES—York boosts output and profits, cuts employee turnover, protects product quality.



OFFICES—York increases employee efficiency, cuts absenteeism and clerical errors, boosts morale.

Wherever People TRAVEL...

CARS—York's compact, powerful auto compressor is used by 90% of independent car air conditioners.

TRUCKS—York all-electric, hermetic truck refrigeration unit delivers constant cooling from idle to top speed.

SHIPS—York has equipped 5 out of 7 Mariners. York offers service facilities in all major world ports.

YORK B/W

...continues the development of refrigeration and heating equipm effective control of temperature

eep"

nt of advanced air conditioning,
quipment for more
ature, humidity and air cleanliness!

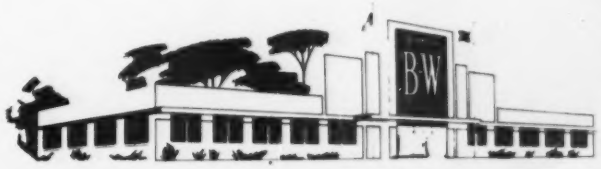
YORK·BORG-WARNER creative engineering continues the development of tomorrow's air conditioning and refrigeration equipment at these modern research centers...

YORK Research Center, York, Pennsylvania

Many pioneering achievements have originated here. This laboratory contains a completely tooled shop in which experimental equipment is built and thoroughly tested. York, a leader in the field since 1885, puts 75 years' experience into every product.

BORG-WARNER Research Center, Des Plaines, Ill.

This multi-million dollar, 36-acre laboratory is equipped with the very latest scientific devices and facilities. Precision instruments, such as the electron microscope which magnifies 100,000 times, enable detailed studies of materials and operating characteristics.



SEE YORK EQUIPMENT ON DISPLAY AT THESE TRADE SHOWS...

Southwest Heating & Air Conditioning Exposition
Memorial Auditorium • Dallas, Texas
Feb. 1-4, 1960 • Booths 706-710 & 807-811

The Western Air Conditioning, Heating, Ventilating & Refrigeration Exhibit and Conference
Shrine Exposition Hall • Los Angeles, California
April 27-30, 1960 • Booths 211-213 & 312-314

OR MAIL THIS COUPON FOR COMPLETE INFORMATION

Mr. Austin Rising
Vice President & Director of Marketing
York Corporation, York, Pennsylvania

Please send me complete product information on the York air conditioning, heating and refrigeration equipment I've checked below:

- ☐ 3-pipe Hi-I Induction System
- ☐ Compound Air Source Heat Pump
- ☐ Lithium Bromide Absorption System
- ☐ Hermetic Turbopak Water Chiller
- ☐ Central Station Air Conditioning Units
- ☐ Packaged Commercial Air Conditioners
- ☐ Residential Heating and Air Conditioning
- ☐ Room Air Conditioners
- ☐ Ice-Making Equipment
- ☐ Other _____

NAME _____ COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

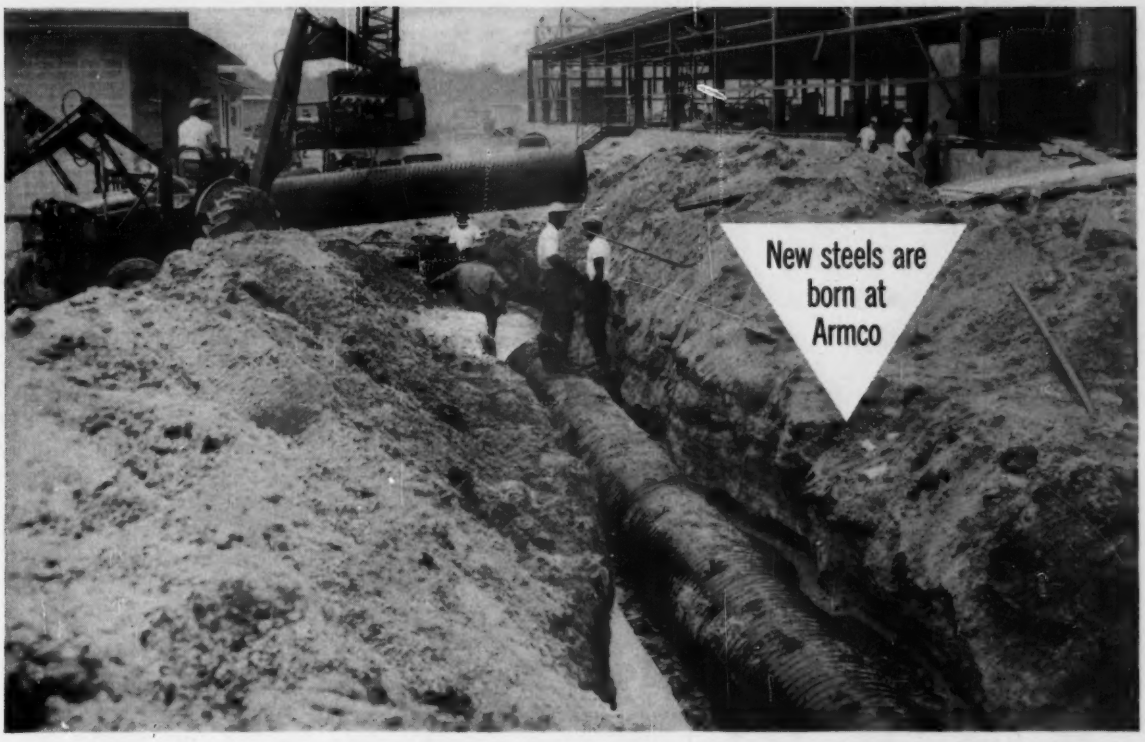
YORK

YORK CORP., SUBSIDIARY OF BORG-WARNER CORP.

YORK B·W DIVISION

BORG-WARNER
RESEARCH & ENGINEERING
MAKES IT BETTER

Air Conditioning, Heating, Refrigeration and Ice-Making Equipment • Products for Home, Commercial and Industrial Installations



Armco ASBESTOS-BONDED Pipe being installed at a new plant of the Bestwall Gypsum Company. Lightweight equipment handles 20-foot lengths of pipe. Note water in trench.

Consulting Engineers Chose Armco Pipe for Difficult Industrial Sewer Job

A 3,200-foot combined sanitary and storm sewer was part of a construction project at the new gypsum plant of the Bestwall Gypsum Company, Brunswick, Georgia. Complicating the usual problems were the soil of a tideland area, a high water table, and salt water from the adjacent Atlantic Ocean. Choice of the consulting engineers for this sewer was Armco ASBESTOS-BONDED® Pipe.

These consulting engineers, Johnson & Johnson, Inc., of Chicago, said, "The reasons for selection of Armco ASBESTOS-BONDED Pipe for this installation were: It has excellent corrosion resistant qualities in tideland and salt water conditions as exist in this location; the pipe is of relatively light weight and long lengths, making it suitable for installation in a soil where settlement is a consideration such as in this location; use of positive connections were possible here, thus reducing the problem of the lines pulling apart if settlement occurs; and the pipe was economical to use."

The new Bestwall Gypsum Company plant will make products from gypsum brought in by ocean-going ships.

Armco ASBESTOS-BONDED Pipe, with invert paving plus a double full-coating of asphalt, was supplied in diameters from 8 to 30 inches. Mechanical contractors on the project were James E. Smith & Sons, Inc., of Louisville and Atlanta.

Write us for factual data on Armco Corrugated Metal Structures for sewers and other drainage applications. Armco Drainage & Metal Products, Inc., 4010 Curtis Street, Middletown, Ohio.

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company • The Armco International Corporation • Union Wire Rope Corporation

The Readers' Guide

A Portrait of the Man at the Top

(page 88)

Every January CONSULTING ENGINEER publishes an article based on a survey of the profession. Each year the subject has been different, and this year it is limited to a special group within the profession – the men at the top. We thought that our readers, whether at the top or on their way there, would be interested in some facts concerning the men who have made it. We pulled from punched cards all of those men who are the heads of their firms, and we took a special look at the data on those cards. We looked intently at educational background, registration pattern, and membership in professional and technical societies. We found out that the "average" head of a consulting firm is far from an average man or even an average engineer. To learn of the many ways in which he differs from the average, take a careful look at the text, the tables, and the charts of this article. They paint an interesting portrait of the man at the top.

1960—What It Holds for You

(page 96)

Our January issue also is distinguished each year by an economic forecast prepared by some outstanding economist. This is the second year we have engaged Dr. Jules Backman, of New York University, as the author of this piece. He was extremely accurate in his forecast for 1959, and we anticipate that he will be equally correct in his forecast for '60. It is improper, perhaps, to condense his conclusions without mentioning the related qualifications, but briefly, it looks like a good year for consulting engineers, with an increase in new construction as a whole. Residential building is likely to be down (this will be hardest on the architect), and public works may fall off some (this will most directly affect government employee engineers), but investment in new industrial and commercial construction should keep consultants going full blast.

From the President of the AIA

(page 108)

John Noble Richards is the senior partner of Bellman, Gillett & Richards, an architectural firm of Toledo, Ohio. If speaking only for himself or for his firm, his ideas, no matter how intelligent and inspirational, would be only those of one architect speaking to a large group of consulting engineers. His ideas, however, are much more than that, for he is more than an individual, he is president of the American Institute of Architects, and, hence, a spokesman for architects in the United States. In Richards' article we have the architects of this country talking to the consulting engineers, and this could be a most important conversation. Richards feels that architects should stick to architecture and engineers should stick to engineering, and he firmly believes that coordination is a part of the architect's job, not the engineer's Whether you agree with him totally, partially, or not at all, it is clear that Richards feels that most can be gained for both professions if they settle their differences through diplomacy and negotiation. Fortunately, much progress has been made in this direction during Richards' term as president of AIA, despite a few eruptions here and there. A few more presidents of Richards' turn of mind, and a little restraint on the part of some few engineers, and there is yet hope for interprofessional understanding.

For More Efficient Nuclear Power

(page 92)

The design of nuclear power plants is still such a novel undertaking that the tendency is to hammer away at the whole heroic concept and forget the importance of the parts. Yet, it is the combination of all the efficiencies that make up the efficiency of the whole and determine the economic feasibility of the design. If every aspect, nuclear or conventional, of every design were investigated fully, much could be done to bring the cost of nuclear energy in line with that generated by fossil fuel plants. Charles T. Chave, Stone & Webster's nuclear engineer, takes up these design problems one by one and points out the possibilities for

Continued on page 50

Things You Should know about

achieving important economic and technical progress in each specific instance.

Alberti's Great Book

(page 112)

Leon Battista Alberti (1404-1472) was by no means the last of the great architect-engineers, but he represents the real beginning of the separation of the professions. Until his time an architect was equally a civil (as opposed to military) engineer – and he was expected to be (as Alberti was) proficient in the design of machines, water works, and bridges as well as an authority on the aesthetics of building. Alberti called attention to the difference, and since he tended to lay more emphasis on the purely architectural, there is little doubt that he helped to bring about the separation. At the same time, it cannot be denied that he was, himself, a great engineer. His book, *De re aedificatoria*, is the subject of the latest piece in James Kip Finch's popular series on the Great Books of Engineering.

The Consultants of Erin

(page 121)

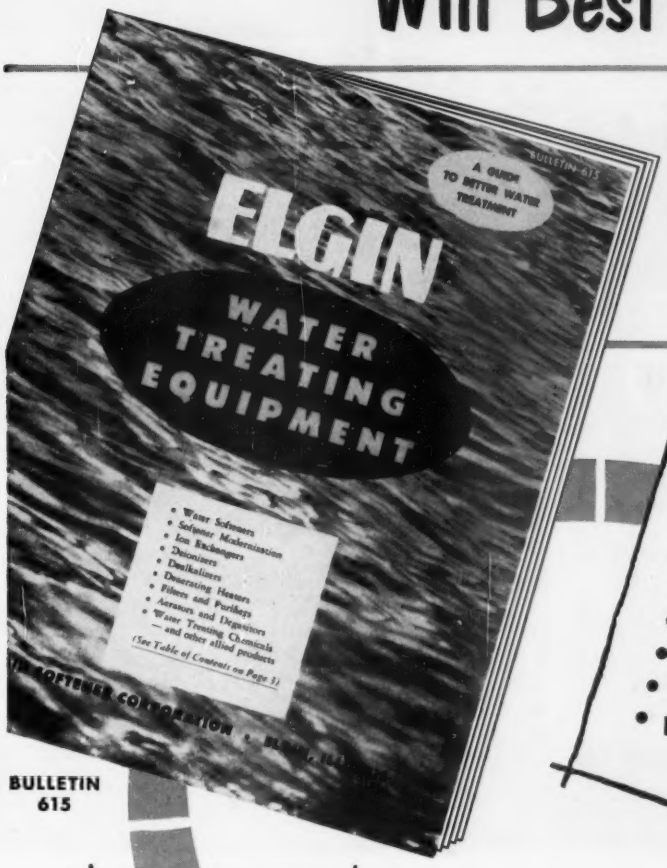
When our Eastern Editor, Marge Oden had dinner a while back with the Association of Consulting Engineers, in Dublin, she found them awaiting a response to their application for membership in FIDIC (the International Federation of Consulting Engineers) to which consulting engineers in the United States belong through membership in the Consulting Engineers Council. She also found that they were having trouble convincing their national and local governments that engineering of public works could be handled better by independent consultants than by engineering employees of the government. They wondered if consulting engineers in the United States were ever faced with that kind of problem! Further conversation backed up the feeling that we and the Irish are much the same sort of people with much the same sort of professional difficulties. Sure, it's a short way from Boston to Dublin and back again.

New Departments

(pages 82 and 34)

The discerning reader will notice several changes in our departments this month. There are two new departments, one called "Quote – End Quote," a collection of statements, declarations, and miscellany. Our editors have selected these from newspapers, magazines, books, and even press releases, the selection being on the basis of interest and importance to the consulting engineer. We think you will find this a tasty potpourri you will seldom want to miss. Also, we have made up a new department for the biographies of our authors. ▲▲

Which Water Treating Equipment Will Best Fit the Job?



BULLETIN 615

This new 24-page bulletin will help you decide

See what it covers:

- Zeolite Water Softeners
- Demineralizers
- Dealkalizers
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- Purifiers
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If you are confused about the many ways to treat water, this new bulletin will help you decide which is best for the job. It describes the various equipment used in treating water and what each is designed to do. Known for quality, dependability and advanced design, this equipment is based upon 50 years experience. For practical guidance in its proper application, the services of the Elgin representative nearest you is yours for the asking.

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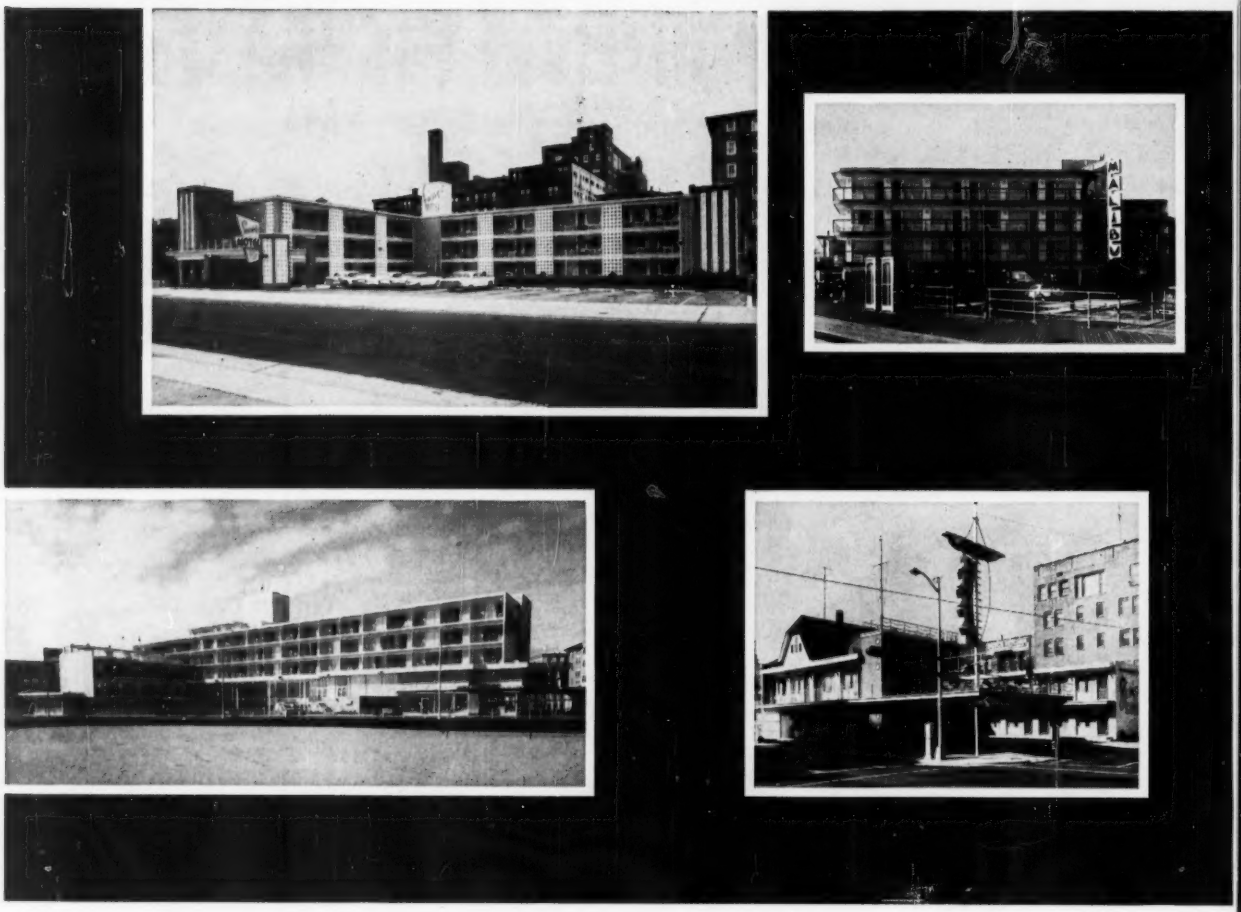
Acme . . . the **practical** approach to

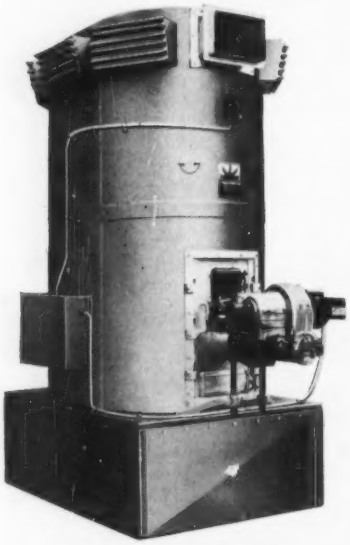


Acme is the word for air conditioning

Here you see a representation of just a few of the many fine motels in and around Atlantic City that feature Acme air conditioning equipment. Fact is, in Atlantic City alone there are 25 quality motels so equipped and on the several turnpikes leading into the City you'll find at least 25 more . . . ranging in size from 25 units to more than 250 and in value from a quarter of a million to almost two million dollars. And in every one of these motels the "heart" of the year 'round comfort conditioning systems, the chillers and the cooling towers, bear the name Acme . . . the name that has been synonymous with quality and dependability in air conditioning and refrigeration equipment since 1919. Yes, "the word" for air conditioning in Atlantic City motels is *definitely* Acme.

Why Acme? Well, the architects and engineers who recommended Acme, the contractors who installed the equipment, the motel owners who are using it could tell you best. But the answer is readily available simply by "adding up" some of the advantages of Acme equipment . . . space-saving, cost-reducing compactness . . . easy to install, factory-assembled "packaging" . . . smooth, quiet, efficient operation . . . minimum-maintenance simplicity and ruggedness . . . convenient, protected controls . . . factory tested and certified performance reliability. These Acme "pluses" and many more are the reason why Acme systems are the answer to air conditioning for multi-room buildings of *all* types . . . motels, hotels, apartments, hospitals, offices. Call your nearby Acme sales engineer.

SAVE on First Cost
SAVE on Installation Cost
SAVE on Operating Cost



Combination Gas-Oil
Model 1000

Savings are continuous with Thermobloc Direct-fired Warm Air Industrial Heaters. Here's why:

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Thermobloc costs less than traditional heating systems

LOW INSTALLATION COST
Thermobloc is a complete heating package—no extras to buy, can be set up and running in a few hours

LOW OPERATING COST
Thermoblocs are misers on fuel — they squeeze maximum Btu's from fuel

Completely automatic, no attendant needed. No long warm up with cold air blast — Thermobloc produces heat fast.

Thermobloc produces heat only when needed, and puts the heat where it is needed. No drafts — no cold floors, with heat wasted at the ceiling. Thermobloc can be floor set, or hung from walls or roof trusses. Either gas or oil may be used as fuel — and there is a size for every Industrial Heating Need.

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Gentlemen,

( ) Please send new Bulletin on Industrial Heating

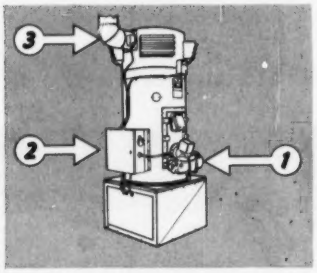
( ) Please have Representative call to calculate our heating requirements, on a no-obligation basis.

NAME.....

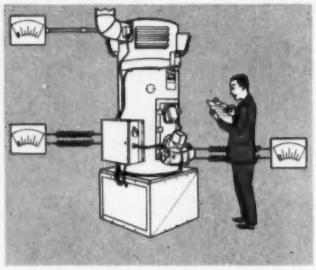
Company.....

Street.....

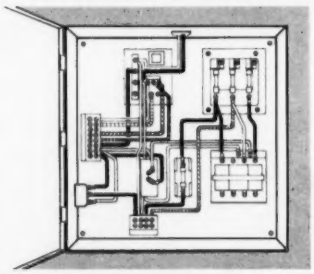
City.....State.....



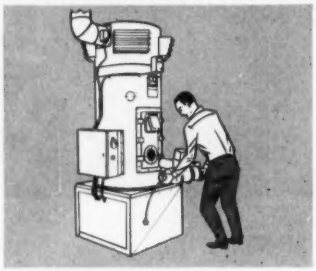
Installation is a simple 1-2-3!
1. Connect fuel line.
2. Hook up power line.
3. Install flue pipe.



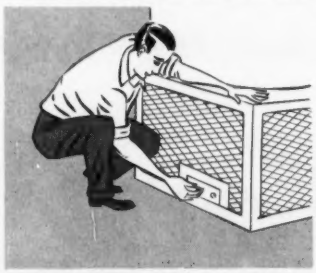
Thermoblocs are test-fired at the factory, and checked out after installation.



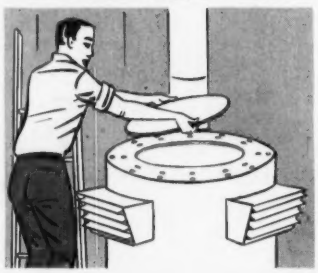
Wiring and controls are in this tamper proof, easily accessible steel box.



Burner is easily accessible — remove four bolts, unplug wires and burner is free.



Blower motors are spring mounted. Belt tension is adjustable from outside the heater.



A single bolt holds cover plate. It's easy to reach tubes and heat exchanger for cleaning.

Report from the West Coast

RALPH S. TORGERSON
West Coast Editorial Representative

Employee Relations

CONSULTING ENGINEERS on the West Coast are becoming increasingly aware of the need to develop employees for greater responsibilities and to make their firms more attractive to engineering graduates.

Employment with a progressive consulting engineering firm should be eagerly sought by engineering school graduates as it offers a more diversified experience and more challenging opportunities to learn about the latest advances in engineering practice than could be found in industrial work. Unfortunately, high initial salaries and job security have attracted the majority of promising graduates to large industrial concerns.

The fault lies largely in not acquainting graduates with the opportunities available in firms in private practice — a project neglected both by individual firms and associations of consulting engineers. The Consulting Engineers Association of California has taken a step in this direction, however, by enlisting speakers from its membership to address undergraduates at engineering colleges and tell them about the private practice of engineering, its ethics, and its business and professional concepts.

Scholarships for Employees

A little self-searching also has convinced consulting engineers that they need to examine their own policies to determine whether they have done all they can to fully develop their present engineering staff. One company has even broadened its educational program to include the children of its staff members who may be interested in an engineering education.

D. C. Wolfe, vice president, Sverdrup and Parcel Engineering Co., San Francisco, commenting on his firm's program, said, "Our company encourages part-time study by our engineering staff. This is aided by part-time scholarships which are available under rules laid down by a Scholarship Committee. In addition, one full time scholarship is awarded to an employee's child for study leading to a degree in engineering from an accredited institution. This program is on a company-wide basis. The office here in San Francisco is a branch office of our firm."

The program of this firm provides for one full-time scholarship with a value of $500 a year for the child of an employee. The award is for study in either aeronautical engineering, architecture, architectural engineering, civil engineering, electrical engineering, or mechanical engineering. The student must have ranked in the upper one-third of his class in high school or prep school or in the upper one-third of his class in his preceding year of study at college.

There are also 19 part-time scholarships of $50 each for employees. The requirements stipulate that the recipient must be a full-time employee, must have the approval of his section head as to suitability of the course of study, and he must have shown proficiency in earlier scholastic work and in work with the firm. He must have been continuously employed by the firm during the 12 months preceding the date on which study is to begin. Should the employee's connection with the firm terminate after an award has been made, he is not eligible for further awards.

The awards are made by a committee composed of employees appointed by the management.

Society Memberships

Frederick J. Converse, Converse Foundation Engineering Co., Pasadena, reports, "Our policy is to encourage employee activity in engineering organizations and to pay their membership fees. One man is working toward registration, and another recently presented a paper at an ASTM Convention, expenses paid. Discussion of engineering and research papers at staff meetings is an ideal that is only fulfilled sporadically. Training within the organization includes work in all

phases of soil engineering – field, laboratory, analysis, and reports."

Registration Important

Guy H. Taylor, of Moffatt, Nichol and Taylor, Portland, Oregon, and president of the Consulting Engineers Association of Oregon, emphasized the importance of the educational phases of employee relations. "Our firm," said Taylor, "has always encouraged employees to improve and better themselves in every way possible. We pay the tuition fees for any available engineering courses they want to take, and we urge them to continue their education. All engineers also are encouraged to take State Board examinations and become registered professional engineers.

"Technical society membership also is stressed, and our employees are active members of various society committees, all with the encouragement of the firm."

Honors Cooperative Program

Kennedy Engineers, San Francisco, has been very active in advancing the professional development of employees. Commenting on their activities, Robert M. Kennedy said, "Perhaps the most significant recent activity is the institution of the Honors Cooperative Program for part-time graduate study at Stanford University. This program originally was set up for the use of electronics firms in the area, and our firm was the first to take advantage of it in the Civil Engineering Department.

"Under the Honors Cooperative Program the student pays half his tuition costs and the firm pays the other half, and in addition, carries him at his regular salary rate. This has enabled some of our engineers to take graduate study in fields of special interest. While it restricts their activities during the academic period to part-time office work, we think that it is well worth the investment in providing an opportunity for an employee to bring himself up to date with the latest techniques and developments in engineering technology.

"Engineers on our foreign assignments have been encouraged to take some basic training in the language of the country to which they are going. While it is understood that short-term training cannot develop any facility in the language, it does provide some advantage in working with the people in the country visited.

"Since the registered engineers in our firm assume a status of limited partnership, we have felt that the money expended on supporting their activities in technical organizations and their attendance at conferences and symposiums has been a good investment in future firm activities. Because of our small turnover, we do not feel that we are subsidizing the employee and equipping him to qualify for other employment opportunities, but rather we feel that we are helping him become a more useful part of our own organization.

"We have for many years sent key engineers on inspection trips throughout the country to review experience with latest developments in equipment and techniques. We feel that these trips enable us to capitalize on new developments as soon as they have left the experimental stage and have been proven by adequate application in the field."

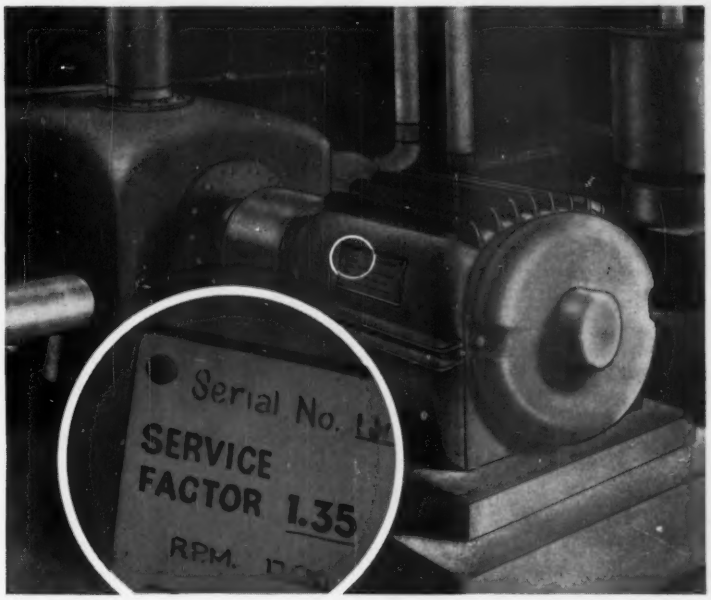
Broad Financial Support

Dudley Deane, of Dudley Deane and Associates, San Francisco, reports that his firm pays the tuition and purchases the books for advanced studies and seminars, both in engineering and business courses. It also encourages professional registration and participation in engineering society activities and pays for all fees and tuition.

M. A. Nishkian, of M. A. Nishkian and Co., Long Beach, Calif., has helped to develop the talents of his engineers by giving them increasing responsibilities under supervision. Projects are assigned

SILICONE NEWS from Dow Corning

New Service Factor Motors Cut Costs



Specify High Service Factor Motors for lowest initial cost, lowest operating costs . . . maximum reliability.

Leading manufacturers now offer motors designed to an entirely new concept. These motors are available in standard NEMA frames of the same size used for conventional motors of the same rating, but look alikes don't perform alike.

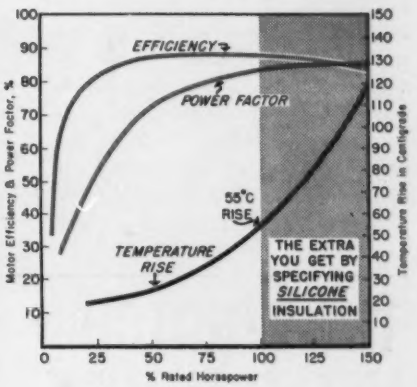
These new motors, insulated with Dow Corning Silicones, have a built-in reserve to carry overloads of twenty-five to fifty percent above nameplate horsepower rating. Here's what this means to you:

Simplified Motor Specifications: Specify motors that are silicone insulated for high service factor. With nameplate horsepower ratings identical to nominal loads, these motors will handle temporary, or even continuous overloading. No need to calculate maximum possible load and add a safety factor. It's already built in.

More Efficient Power Use: Power factor problems are reduced . . . excessive power bills resulting from part-load motor inefficiencies are brought in line. Because motors operate at rated output, the need for capacitors to correct power factor is substantially reduced.

Less Installed Horsepower: With motors rated to match normal loads, total installed plant horsepower will be substantially less. Using conventional methods of determining distribution system needs, transformer and switchgear requirements are lower—less costly units can be safely specified.

Motors insulated with Dow Corning Silicones for high service factors are available now from leading motor builders. For more information on what silicone insulated equipment can mean to you, write Dept. 1001.



How do manufacturers build so much extra into a motor? By substituting an insulation system made from Dow Corning Silicones for the Class A insulation system used in standard lines. Only the insulation changes. Frame, electrical steel and copper remains the same. And there's one change on the nameplate.

Service factor rating goes up. On a TEFC motor, for example, service factor goes up from 1.00 with Class A insulation materials to somewhere between 1.25 and 1.50 when silicones are used, depending on manufacture and horsepower rating.

Handling liquid of varying viscosity, this 5 hp, 1.25 service factor motor withstands overloads, including those created by excessive tightening of pump packing glands.

Motors insulated with Dow Corning Silicones give reliable operation in almost any surroundings—regardless of high ambients, moisture, many corrosive atmospheres. And on the basis of capability, high service factor motors generally cost less than conventional motors.

to key personnel for coordination and follow-through with the opportunity to discuss problems with the client's representative or their engineering department along with Nishkian. Commenting on the firm's policy, Nishkian said, "I have always encouraged and assisted all qualified employees to obtain professional registration, and to become members of engineering societies of their choice and participate in their activities. Financial aid is given to all promising employees who indicate a desire to enroll in the advanced courses offered at engineering schools."

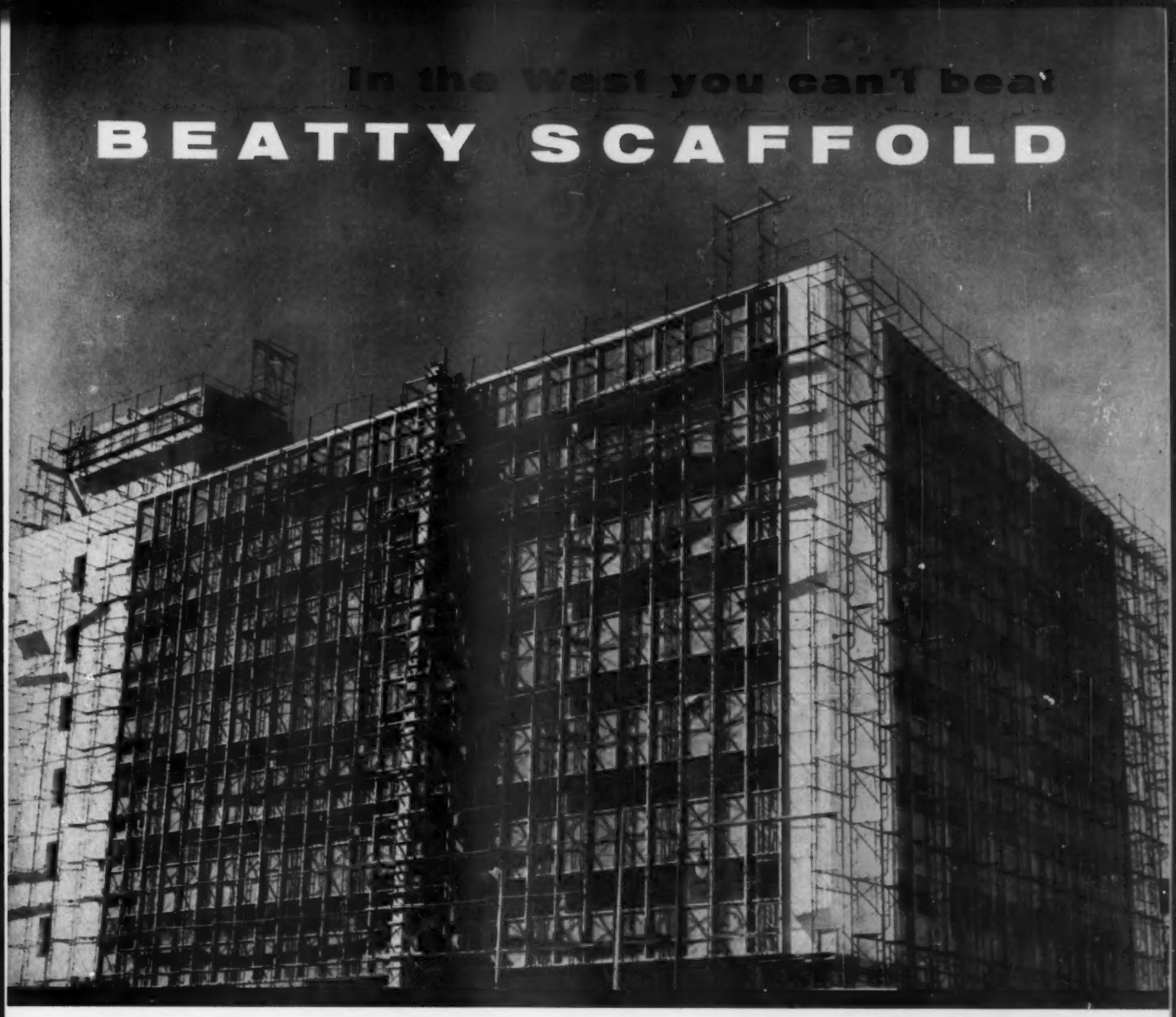
Harold P. King, of King, Benioff and Associates, Sherman Oaks, California, has discussed the problem of keeping employees interested in advancement in engineering with his partner, Ben Benioff, and has set up a program urging membership and active participation in the Structural Engineers Association of California and in ASCE. The firm pays dues and part of the expenses at conventions. The firm also pays employees to attend various special schools and seminars on technical subjects. Employees have taken turns in participating in these courses.

Special Training Encouraged

Richard J. Woodward, of Woodward, Clyde, Sherard and Associates, Oakland, has been very active in promoting advancement of employees in their profession by their taking advanced studies and also by an internal program of education. "We have been paying tuition fees," said Woodward, "for employees who are taking courses to improve their knowledge in our field. On a few occasions, we also have allowed employees to take time out from work to attend classes given during the day. We try generally to do everything we can to encourage employees to take courses so they can improve themselves.

"We also from time to time hold seminars within the organization to bring employees up to date on the latest findings in our particular field. This is sometimes done by members of the firm. However, we also have members of the teaching profession come in on occasion and give talks to our engineers.

"Since we are in a specialized field, most of our engineers have had graduate work in our specialty before they join our firm. Universities in the Bay area which offer graduate courses in soil mechanics do not generally do so in the form of evening classes. It is practically essential, therefore, that anyone doing work for a graduate degree actually take a leave of absence from his job. I believe the schools in this area require at least one semester of residence in order to complete the work for a graduate degree. Because of this, most of the courses taken by our employees are courses offered in the Extension Division in the evening." ▲▲



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2. SERVICE you can depend on. Our own truck fleet assures "on time" delivery and pick-up. From original quote on . . . you can't beat Beatty!

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Protected by: 3-4000 amp. BUSS Hi-Cap Fuses . . . 12-600 amp., 30-400 amp., 3-200 amp. FUSETRON Fuses.

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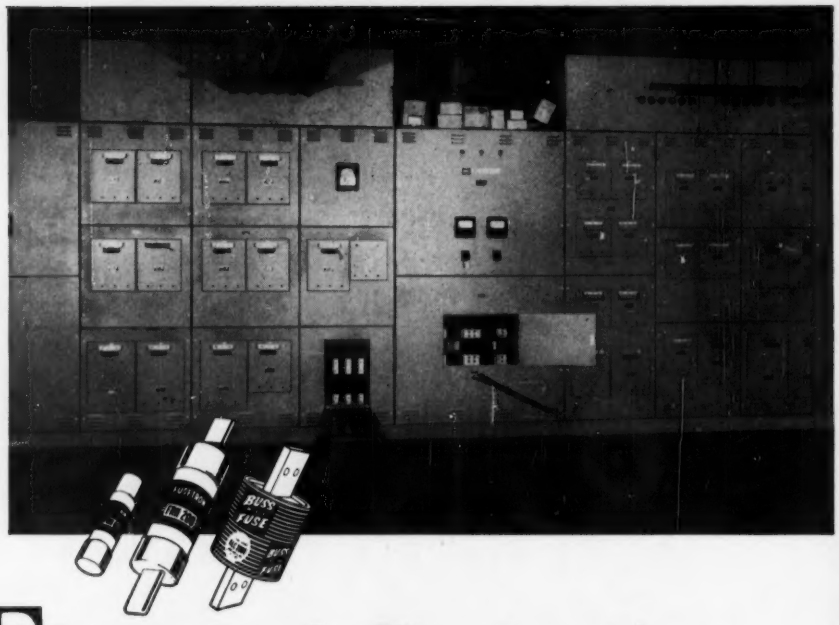
All distribution panels protected by FUSETRON dual-element fuses.



Electrical Protection goes MODERN *with* BUSS Fuses

in St. Louis' Newest Multi-Storied Office Building . . .

The Thomas Jefferson Building is another outstanding example of BUSS Hi-Cap and FUSETRON dual-element fuses meeting the requirements for a modern protective device for use in modern electrical systems.

Today's electrical networks, with their tremendous capacities, have emphasized the need for a superior protective device that can be relied on to safely and dependably handle faults of great magnitude.

BUSS Hi-Cap and FUSETRON fuses, because of their high interrupting capacity and life-time dependability have become the natural choice in both new installations and when electrical systems are being modernized.

WHY HIGH-INTERRUPTING CAPACITY AND DEPENDABILITY ARE ESSENTIAL FOR A MODERN PROTECTIVE DEVICE...

CAPACITY

The magnitude of fault current is only limited by the capacity of the transformers or networks. These capacities have been increasing yearly — and most likely will continue to increase.

A modern protective device, therefore, must be capable of interrupting faults of 75,000 to 150,000 ampere which are available today — and be adequately safe to allow for future system growth.

BUSS Hi-Cap and FUSETRON dual-element fuses meet this requirement. The interrupting rating of BUSS Hi-Cap fuses is 200,000 rms symmetrical — and for FUSETRON fuses it is 100,000 rms symmetrical.

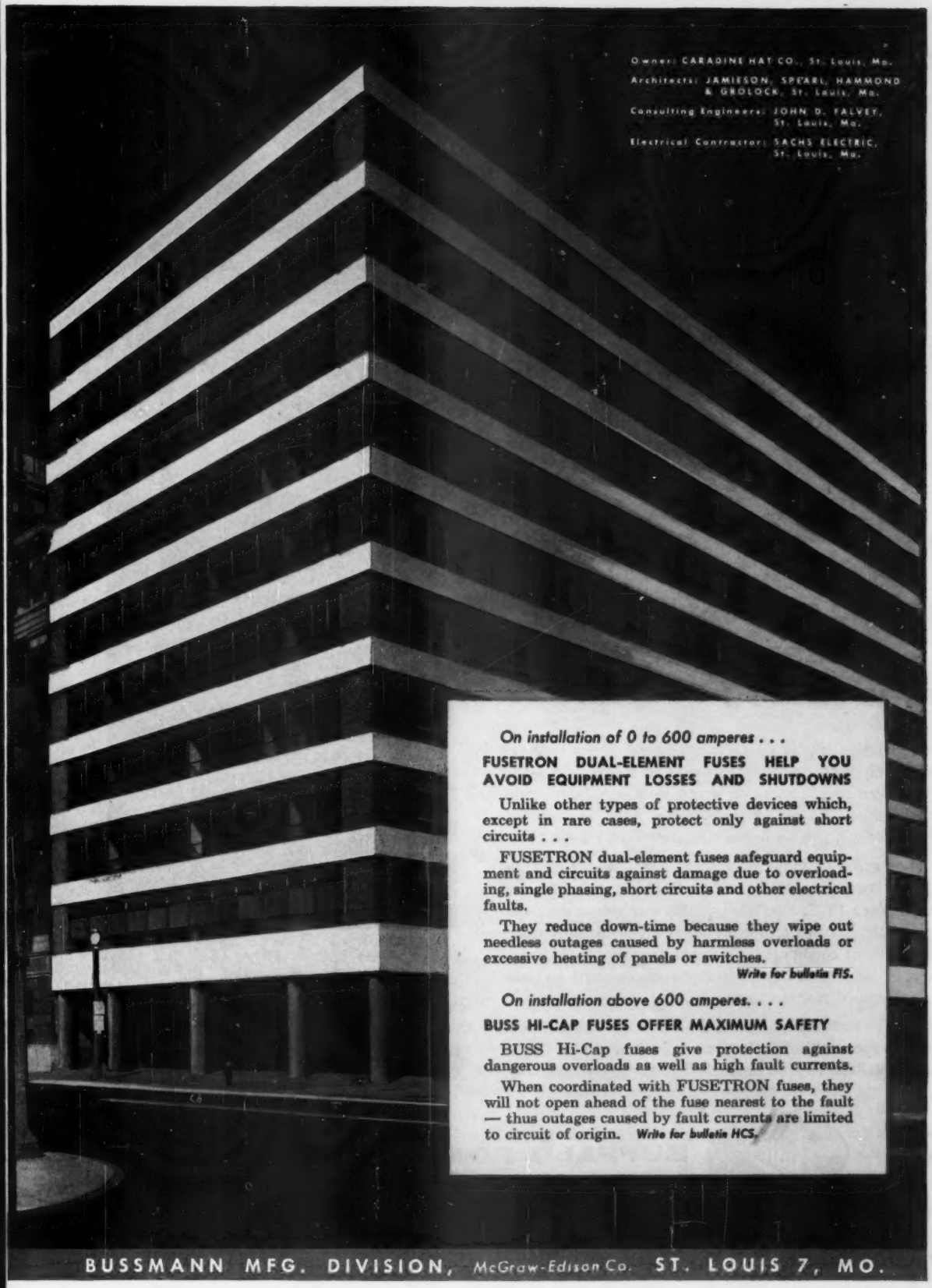
LIFE-TIME DEPENDABILITY

The *Modern* protective device should remain just as safe and accurate through the years as it is on the day installed. Otherwise, how can you be sure it will interrupt these high fault currents should trouble occur 10, 15 or 20 years from now.

This requirement too, is met by BUSS Hi-Cap and FUSETRON fuses — They remain safe and accurate and require no periodic inspection or recalibration, as they have no hinges, pivots, latches or contacts to stick or get out of order.

1159

ANOTHER BUSS HI-CAP AND FUSETRON FUSE INSTALLATION



On installation of 0 to 600 amperes . . .

FUSETRON DUAL-ELEMENT FUSES HELP YOU AVOID EQUIPMENT LOSSES AND SHUTDOWNS

Unlike other types of protective devices which, except in rare cases, protect only against short circuits . . .

FUSETRON dual-element fuses safeguard equipment and circuits against damage due to overloading, single phasing, short circuits and other electrical faults.

They reduce down-time because they wipe out needless outages caused by harmless overloads or excessive heating of panels or switches.

Write for bulletin FIS.

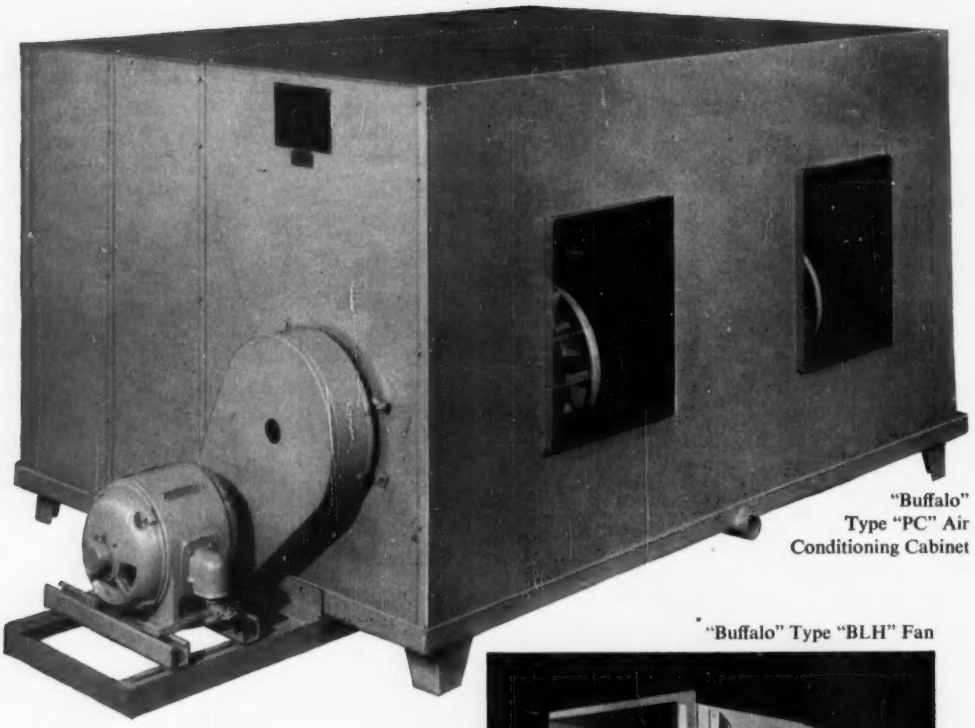
On installation above 600 amperes. . . .

BUSS HI-CAP FUSES OFFER MAXIMUM SAFETY

BUSS Hi-Cap fuses give protection against dangerous overloads as well as high fault currents.

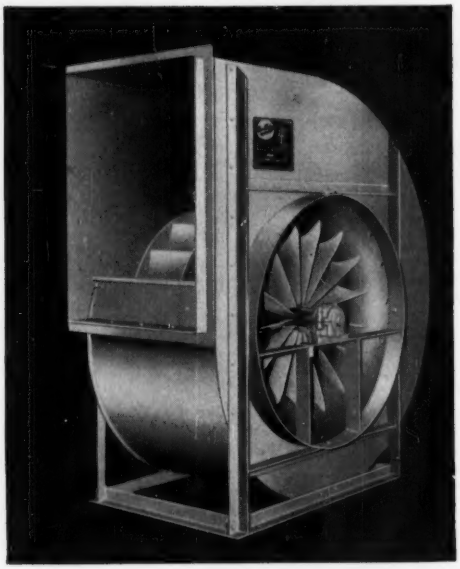
When coordinated with FUSETRON fuses, they will not open ahead of the fuse nearest to the fault — thus outages caused by fault currents are limited to circuit of origin. ***Write for bulletin HCS.***

BUSSMANN MFG. DIVISION, McGraw-Edison Co. ST. LOUIS 7, MO.



"Buffalo"
Type "PC" Air
Conditioning Cabinet

"Buffalo" Type "BLH" Fan



"BUFFALO" QUALITY HELPS PRESERVE YOUR PRICELESS REPUTATION

Your reputation is your most priceless asset. Every time you specify equipment, your reputation is at stake. That's why you base your specifications on sound, reliable, **quality** equipment. Promises are not enough . . . you must be sure that performance will live up to the manufacturer's claims.

When you specify "Buffalo" Fans and Air Conditioning Cabinets, you know you can depend on QUALITY through and through. Since 1877, "Buffalo" quality has meant peak **efficiency** on the job. It's meant the utmost **dependability** under the most severe conditions. It's meant **economy** in the truest sense . . . a long life of trouble-free performance with an absolute minimum of maintenance.

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Your nearby "Buffalo" engineering representative will be glad to work with you in choosing the **right** equipment for your air conditioning jobs. Contact him, or write us direct for full information.

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Heard Around Headquarters

RALPH WESTCOTT, president of Consulting Engineers Council, managed to visit seven government agencies and representatives of six national organizations on a recent trip to Washington. Although he met with a favorable reception on all of his appointments, the most notable success was with the Bureau of Yards and Docks.

As Westcott explained, architect and engineer contracts with the Bureau of Yards and Docks contain a clause requiring that the designer produce new plans at no additional fee if no contractor bids the original plans within the allotted budget. There is no provision for time delays. Therefore, the government can bring out plans several years old, ask for bids, get none within the budget allowance, and request the consulting engineer to redesign the project at no charge.

When this situation was brought to the attention of Bureau officials, Westcott said they readily agreed that the current contracts are somewhat unfair in this redesign clause. Furthermore, Westcott was told the Bureau's procurement manual and documents currently are being revised, and this redesign clause will be changed to the mutual satisfaction of all concerned.

Bureau officials told Westcott this clause never had been brought to the attention of the proper officials before. Under the present system, any consulting engineer who thinks he has been asked unfairly to redesign a Bureau project has no alternative but to ignore the matter or file a claim against the government.

In a visit with Air Force officials, Westcott discussed the inadequacy of current per diem fees for consulting engineers. He reported that the Air Force representatives understand that per diem fees include employee salaries and overhead, and they agreed that something should be done to bring per diem fees to a minimum of $100 per day. "I would like to see the Council take some action toward getting this done, but no course of action for such a project has been established yet," Westcott added.

Westcott also stopped in to see the Comptroller General, Joseph Campbell, in regards to the recent General Accounting Office report to Congress on the Bureau of Public Roads appropriations. Campbell said he personally approves the use of consulting engineers on peak load projects. However, during Congressional appropriations committee investigations this year, a close comparison will be made between the scope of engineers' contracts and the fees paid.

Westcott's agenda also included meetings with several other groups.

¶ Federal Aviation Agency — The CEC president was assured the engineering division of FAA does none of its own design work. Consulting engineers are used. Furthermore, they are selected on a basis of professional competence.

¶ Bureau of Reclamation — "Moonlighting" was discussed. Westcott was informed the Bureau currently is preparing a policy statement making it clear that future outside employment by Bureau employees will not be tolerated if there is even a remote chance of conflicting interests.

¶ Automotive Safety Foundation — ASF president Joseph Mattson informed Westcott that the Safety Foundation is in no position to recommend the use of consulting engineers or to recommend that states do their own design work in lieu of retaining consultants. "We studiously avoid detailed design recommendations in our studies. However, after the studies are completed, they are the property of the individual state, and we have no control over the report's future use," Mattson said. Referring to the Pennsylvania Safety Foundation study, which recommended the use of consultants be reduced substantially during the next few years, Westcott said the situation in Pennsylvania was somewhat unique, and "I personally am satisfied with Mr. Mattson's explanation of why that report came out as it did."

¶ Council of Mechanical Specialties Contractors Institute — It was agreed that CMSCI and CEC will work together in the future on problems concerning the related responsibilities of contractors and engineers.

¶ Associated General Contractors — Westcott explained the history and aims of CEC. "I think the door is open, and CEC and AGC will be able to work together in the future. I particularly would like to see a single general conditions document

developed by the two groups to cover all elements of the construction industry," Westcott added.

¶ Producers' Council – It was agreed that the joint committee with the Council will go ahead as quickly as possible on development of a catalog filing system.

Westcott also held brief meetings with representatives of the Defense Department, American Institute of Architects, National Society of Professional Engineers, and Bureau of Public Roads.

"Cease and Desist"

In another action of interest to consulting engineers, the Atomic Energy Commission is being requested by the National Society of Professional Engineers to "cease and desist" taking bids based only on definitive sketches of proposed construction projects.

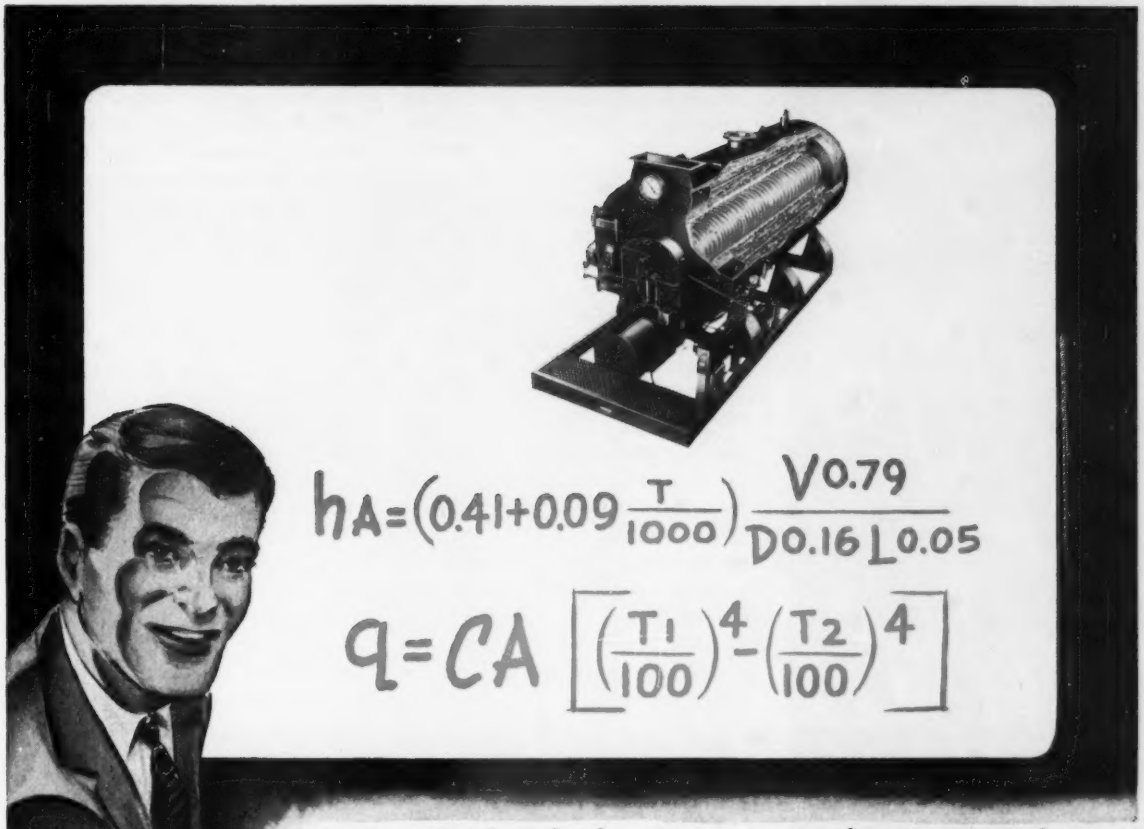
In a resolution prepared by the Washington (State) Society of Professional Engineers, it was pointed out that AEC took such bids at Hanford, and that "this is understood to be a policy established by the Atomic Energy Commission, Washington, D.C." The resolution adds that the practice ignores the fact that preliminary designs must be complete before intelligent bids can be made, and also increases the chances of professional engineers bidding against each other while acting as contractors' agents. Furthermore, since only the professional engineering firm retained by the successful contractor is paid for his efforts, this practice could result in increased fees on future construction projects.

The resolution asked that NSPE:

"1. Request that the AEC cease and desist from this type of proposal and negotiate A.E. contracts as set forth in NSPE Policy No. 12.

"2. Request that construction contracts be let only on firm plans and specifications to allow all contractors to base their bids on known quantities.

"3. Point out to the AEC that the policy they are pursuing will re-



Here's a Quick Refresher Course on Combustion Principles . . .

A Cyclotherm Sound Film-Strip that you and all your engineering friends should see

Every engineer interested in combustion should be sure to see the Cyclotherm sound film-strip, *Heat Transfer and Cyclonic Combustion*. Written by engineers, from a professional, not a promotional, point of view, this film is a quick refresher course in the principles of boiler engineering. *For engineers only* – too many mathematical formulae for the man-in-the-street to follow.

Cyclotherm has also prepared a manufacturing film which shows, step by step, how Cyclotherms are built. Beginning with the flat plate arriving from the steel mills and finishing with the complete boiler shipped to the customer, this film illustrates what we mean when we say that "one manufacturing responsibility is behind the entire equipment."

We'll be glad to arrange for an early showing of both these films. Invite other engineers in your company, as well as members of any engineering group to which you belong. You can see each film in 20 minutes – and you'll find them 20 minutes very well spent. For full information, write us today.

The Cyclotherm manufacturing film almost equals a trip through the Cyclotherm plant.

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STEAM AND HOT WATER GENERATORS

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sult not only in unethical practice but will also increase cost of the proposed construction at the taxpayers' expense."

Meditating

Meanwhile, the Employment Practices Committee is studying two interesting recommendations from the Minnesota Society of Professional Engineers:

"1. All technical documents of a Federal engineering or engineering-manufacturing contract, including the proposal, reports, plans, and specifications shall be certified by the registered engineer who is in immediate 'responsible charge,'

"2. Performance characteristics of all purchased devices which require the practice of engineering in their design shall be certified by an engineer who is registered in the state in which the device is manufactured."

Functional Sections

A year-end tally shows that 23 of NSPE's member societies have functional sections for engineers in private practice. And the executive committee heading up these affiliates at the national level believes in the optimistic approach to money problems.

Discussing the extensive functional section plans for the future, the committee "was of the unanimous opinion that consulting engineers would consider it a privilege to have the opportunity to augment the budget in some fashion. We propose a solicitation in the form of contributions from consulting engineering firms to support the aims and programs approved by this section. The suggested formula for contributions shall be based upon $5 per registered engineer in each firm."

The NSPE Functional Section Services Committee also is recommending organization of functional sections for another group — surveyors. "To maintain the close working relationship which has existed between engineers and surveyors and thus avoid a separate organization trend," the state societies were encouraged to form additional surveyors functional sections to augment the six that already are in existence.

In answer to queries, NSPE has stated several times that land surveyors who are not registered engineers cannot be members.

ASME Annual Meeting

Top news at the annual meeting of the American Society of Mechanical Engineers in Atlantic City this year was the ASME decision to expel a member for violation of the Code of Ethics. Nobody can remember the last time such a thing happened, but estimates are that it was at least 20 years ago.

The former member, who received notification of his expulsion last month, is Charles M. Miller, of Santa Monica, California. Miller was found guilty, in a court case some time ago, of revealing trade secrets belonging to Monsanto Chemical Co. Miller was accused of taking blueprints belonging to Monsanto while he was an employee, then later using the blueprints to his own advantage.

As the judge pointed out to the court, "There is no real substantial difference in the matters determinative here between Miller's common law obligation and his contractural obligations."

The case has been under consideration by ASME for about one year. Miller was invited to appear in his own defense, but instead he chose to have his attorney submit a brief on his behalf.

Also at the convention, the first major change in regional boundaries since the eight ASME regions were established was made, with the creation of two new regions in the West. Reason for the change was to lessen the distances regional vice presidents would have to travel in order to attend the desired number of meetings.

Next on the agenda is a study of the Eastern regions. Here, distance

Sewage Pump Well Elevation Held at 114.5′±3″ Despite Big Variations in Flow

Three of four E-M 200 hp, 1200 rpm Vertical Synchronous Motors with Adjustable-Speed Magnetic Drives at Nut Island Sewage Treatment Plant of the South Metropolitan Sewage System in Quincy, Massachusetts.

E-M Vertical Synchronous Motor and Magnetic Drive Unit for adjustable-speed power transmission to vertical centrifugal pump. The ring element (1) mounted directly on the motor shaft turns at motor speed. The magnet element (2), mounted inside the ring element, has no mechanical connection to the motor . . . torque is transmitted through magnetic flux linkage between ring and magnet. By varying amount of excitation to magnet, pump speed can be precisely controlled.

AMAZINGLY PRECISE CONTROL OF SEWAGE PUMPS OBTAINED WITH E-M ADJUSTABLE-SPEED MAGNETIC DRIVES

One of the critical problems in operating Boston's new Nut Island Sewage Treatment Plant is complete control over the wide daily, weekly or seasonal flow variations. For example, flows may vary from 63 mgd to 249 mgd, with peak loads of nearly 300 mgd during stormy periods.

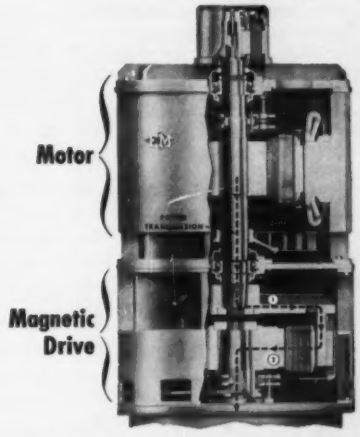
The pump well has to maintain an elevation of 114.5 feet with not more than 3 inches variation, to assure proper levels and flow velocities in the sewage processing channels. Control of the output of the low-lift sewage pumps has to be fast and remarkably accurate.

Use of E-M Adjustable-Speed Magnetic Drives for the low-lift pumps provides the sensitive speed control necessary in maintaining this close command of the pump well elevation.

Pump speed changes are dictated by a well float that actuates the Magnetic Drive through an E-M "Regutron" Control. Pump speed is automatically increased or decreased to maintain precisely the required pump well elevation. The Magnetic Drives are highly important and effective factors in most efficient operation of the Nut Island Sewage Treatment Plant for eliminating pollution in Boston Harbor.

For more information, see your nearest E-M sales engineer. And write direct for a copy of E-M Synchronizer No. 38 which tells the complete story of this outstanding installation.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA



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is no problem. Instead an attempt will be made to assure groupings consisting of members with common interests. As O. B. Schier II, ASME secretary, pointed out, decentralization of industry has created some problems through moving large groups of engineers to isolated areas.

The subject of professional unity still is very much on the ASME mind. Outgoing president Glenn B. Warren said, "This is usually referred to, perhaps unfortunately, as 'unity of the profession.' A better description of the plans that most of the engineering societies' leaders have in mind would be 'cooperation among engineering societies,' or 'coordination of professional work.' No responsible engineering spokesman feels it would be desirable to dissolve existing groups or to 'hamstring' the indispensable work now being conducted by them for their own members."

Warren, who will continue as a member of the task force of Founder Society Presidents on Unity, still has hopes that the modified functional plan for unity will become a reality in the near future. This plan takes the basic American Institute of Electrical Engineers functional plan — the Engineers Joint Council handling technical matters; the National Society of Professional Engineers being responsible for professional matters; and the Engineers Council for Professional Development continuing to be responsible for education — and adds an "umbrella committee" over all three. This would involve creation of what Warren calls an American Engineering Association.

The Founder Societies still are divided on the methods of achieving unity. Roughly, the division is the American Society of Civil Engineers, the American Institute of Chemical Engineers, and the American Institute of Mining, Metallurgical and Petroleum Engineers favoring unity through EJC, with ASME, AIEE, and NSPE holding out for the functional plan or some modification of it.

Warren also spoke on education. "The educator today is still using the tools of 150 years ago, i.e., a textbook, a blackboard, pad and pencil or pen, crude laboratory equipment in some instances, and devoted personal instruction, but applied through a presentation by the instructor of much the same material over and over again, year after year.

"I believe it is absolutely necessary that at an early date the educators develop and put into use the extensive audio-visual communication and teaching aids to the education process that modern technology has provided . . . In my judgment, these should be used on alternate days with automatic or student aide projection, with the teacher personally handling the class on the alternate days . . . A teacher's coverage of students in this way could, in my judgment, be doubled or tripled, and we could, therefore, afford to pay them more, as we do others whose effectiveness is increased."

The new ASME president, Walker L. Cisler of Detroit Edison Company, devoted his speech to international relations, recommending that engineers, "who speak the same language all over the world," step to the forefront in relieving tensions through a sort of "people-to-people" program.

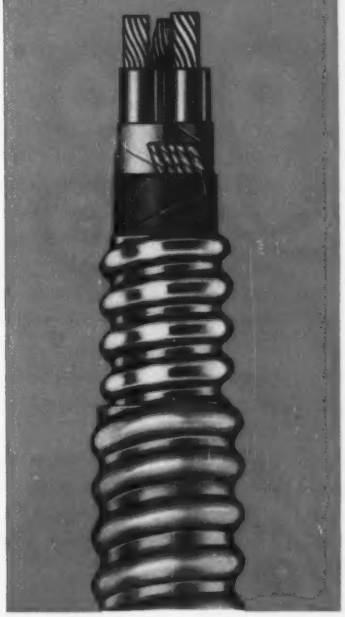
Cisler, who recently traveled in Russia, said, "We were taken into areas of the country where our own diplomats have not been permitted to travel — and I think we had this freedom because we came as private citizens and had shown a willingness to meet them on a common basis."

The ASME annual report, to be distributed this month, termed the first year of ASME's group medical insurance highly successful. "By October, nearly 3000 applications had been received. All categories of Society members are participating in approximately the

C-L-X INTEGRATED CABLE SYSTEM

Requires no separate Duct or Conduit in any environment

Unusual pliability of C-L-X Sheathed Cables is shown here as the cable is being installed.



The revolutionary C-L-X Continuous, Corrugated, Lightweight, metallic sheath, that Simplex introduced to this country two years ago, is now available in *Aluminum*, *Copper* or *Bronze* as well as the enormously successful *Steel*.

Simplex C-L-X pliable cable systems provide unexcelled ease of installation and mechanical protection.

The *corrugated* metal sheath combines pliability for ease of installation with very great strength and seals the cable against penetration by oil, chemicals and moisture.

Depending on the environmental conditions of the installation, these power, control and communication cable systems can be furnished with or without plastic jacketing.

Light, and pliable, C-L-X cables are easily installed, and require no special reels.

Now, with corrugated *Aluminum*, *Copper* or *Bronze* sheathed C-L-X cable systems, the low resistance of these metals permits designs where the sheath may be used as a neutral or ground. These metals also permit the use of single as well as multiconductor cable assemblies in a-c power systems.

For complete details on C-L-X sheathed cables, contact your Simplex Engineer, or write direct.

See C-L-X in Steel, Copper and Aluminum at the PLANT MAINTENANCE SHOW BOOTH NUMBER 212

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same ratio as their grade of membership in ASME."

Continued cooperation with the Engineering Institute of Canada was mentioned, with one of the highlights of the year listed as the Third Biennial Conference on Engineering Education, which was cosponsored by ASME and EIC.

Preliminary work is being done on the international standardization program, which ASME considers quite important. This program is aimed at standardizing engineering practices rather than in the preparation of formal codes or standards. ASME is a member of the United States national committee, which works through ASA. Representatives of about 30 other nations also take part.

ASME membership is at an all-time high, with more than 58,000 members, an increase of about 2000 during the past year. A good percentage – 3000 persons – attended the Atlantic City meeting.

Speakers at the Professional Practice Committee meeting were V. O. Schinnerer, of Continental Casualty Insurance Co., who discussed architect and engineer professional liability; N. A. Christensen, of Cornell University, who told of past and projected efforts of the American Society for Engineering Education to prepare a casebook on ethics; Col. Burnside R. Value, of Seelye Stevenson Value & Knecht, New York City, who discussed the problems of consulting engineering projects abroad; and G. Lorne Wiggs, of Wiggs, Walford, Frost & Lindsay, Montreal, who told about the practice of consulting engineering in Canada.

Getting Ready

Next month, the New York State Society of Professional Engineers will hold a chapter presidents meeting in Albany to find out what the "grass roots" thinks of certified registration. This is a proposal whereby it would be required that before a licensed engineer can become registered he must show that he is a member in good standing of NYSSPE. The announced aim is better policing of ethics in the engineering profession.

The New York County Chapter – with 1200 members – has passed a resolution in favor of some better method of control over professional ethics by the society. However, the resolution, which passed by a margin of 10 to 1, made no mention of the question at hand – certified registration.

NYSACE Activities

This month, the New York State Association of Consulting Engineers hopes to take two steps forward – become active in the Empire State Chamber of Commerce, and circulate a brochure publicizing the State Association.

At the annual meeting last October, the Association voted to join ESCC. "It attempts to keep its members informed as to state governmental programs and policies affecting business, to stimulate and encourage business organizations in the discussion of problems and policies affecting business, and to express the views of N. Y. State business on public programs," the directors were told. The membership became effective as of Jan. 1.

The 8½" x 11" state brochure is being sent to member chapters. It was suggested that each chapter insert a list of membership in the folder for local distribution.

The State Association also has been corresponding with the American Institute of Steel Construction in regards to design done by structural steel fabricators. NYSACE pointed out that contractors get a contract with a client, the steel fabricator does the design for the contractor, and the fabricator's engineer signs the plans. The Steel Construction group stated it has instructed members not to do design.

The four State Association chapters also have active programs.

Currently, the Central New York Chapter is conducting a series of

In the Chicago area you'll find hundreds of Arkla-Servel Sun Valley Gas air conditioners in food stores, drug stores, general stores, restaurants, taverns, halls, beauty parlors, medical centers, business offices, service offices, plant offices, small factories, small shops, repair shops, barber shops, branch offices . . . bringing year 'round comfort to customers and employees.

"More and more Chicago businesses are cooling with **GAS!"**

Many Chicago firms need a compact, automatic unit that will both heat and cool at low cost. That's why – in a one year period – 275 Arkla-Servel Sun Valley Gas air conditioning units were specified and are being used in business places throughout the Chicago area.

With this central Gas unit, there's no need for fans, window air conditioners or separate cooling units. The design is so clean and simple that it can be installed wherever there is room . . . out in the open, on the roof, in the basement, or in the back room.

In addition to heating and cooling, the Arkla-Servel Sun Valley unit also cleans the air, dehumidifies and ventilates to assure year 'round comfort.

This Gas air conditioner is flexible, too – comes in 3½ and 5-ton units which can operate singly or be adapted to multiple installations depending upon the amount of space to be air conditioned.

If your customers and employees sweltered this summer, think now about installing a Gas cooling system before next year's heat wave is here. For specific information, call your local Gas company or write to the Arkla Air Conditioning Corporation, General Sales Office, 812 Main St., Little Rock, Ark. *American Gas Association.*

employee conferences. The aim is to teach engineers in one field the problems encountered by those in other fields. A few basic pointers are being given in such things as teaching structural engineers to read mechanical engineers' drawings, and vice versa.

In Rochester, Chapter members are giving lectures to architects preparing for license examinations.

The Western New York Chapter has been holding a series of meetings attended by architects, engineers, and contractors. Joint problems are discussed.

The Long Island Chapter building codes committee is attempting to have building codes changed to require supervision by a registered architect or engineer on all buildings of more than 10,000 square feet. The committee also is suggesting a wind load of 20 psf minimum as a design criteria for all buildings, regardless of height.

Salary Survey

The New York Association of Consulting Engineers' semiannual survey shows that there has been an increase in salaries of employees; that a majority of the member firms give employees eight paid holidays a year; that more than 90 percent have pension plans; that 73 percent work on a bonus system; and that 79 percent have profit sharing.

Average weekly salaries at the time of the survey were: junior draftsmen — $75 (increase of $5 since 1957); draftsman — $107 (increase of $12); designer-draftsman — $135 (increase of $17); senior designer or project engineer — $167 (increase of $24); and project manager or supervising engineer — $196 (increase of $21).

Of the firms surveyed, 79 percent give one or two weeks termination pay, and 6 percent even give an employee who quits the firm two weeks salary.

The survey concluded with the fact that only 30 percent of the member firms have a policy and procedure manual or an employees handbook.

Overlapping Meetings

The Atomic Industrial Forum and the American Nuclear Society scheduled their meetings recently in Washington, D.C., so members could make one trip to attend the overlapping sessions.

The Forum and ANS, which withdrew from the Engineers Joint Council-sponsored Nuclear Congress last spring, did not hold an exposition this year. However, the two groups voted to hold overlapping meetings with an Atomic Industries Exposition, one in San Francisco on Dec. 12 to 15 in 1960, and another in Chicago during the week of Nov. 6 in 1961.

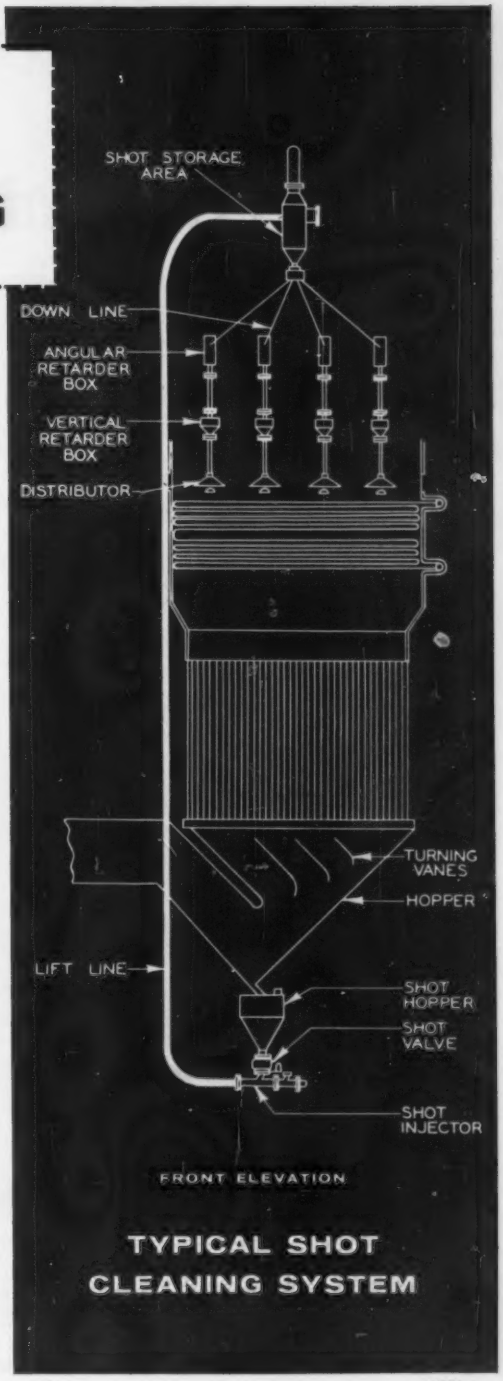
CEAO Meeting

At the November meeting of the Consulting Engineers Association of Oregon, the subject of "The Engineer As An Expert Witness' was discussed by Judge Allan Davis and Jeffery M. Holbrook, property appraiser. Judge Davis made the point that a responsible engineer called upon to appear as an expert witness should understand some of the techniques of discrediting a witness' testimony, and he should assemble his facts so that he is able to weather cross examination. He also should be fully aware of his professional responsibility in presenting evidence to a jury composed of people who may have no technical knowledge.

Lin Talks at Seattle

Dr. T. Y. Lin, professor of civil engineering at the University of California, and an international authority on thin-shelled structures and prestressed concrete, was the featured speaker at a joint meeting in November of the Seattle chapter of the Structural Engineers Association of Washington and the Washington State Chapter of AIA. Dr. Lin headed a mission of American concrete experts to Russia last year. ▲▲

DIAMOND
SHOT CLEANING



TYPICAL SHOT CLEANING SYSTEM

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Its Advantages

This system offers much improved cleaning of certain areas of boilers such as tubular air heaters, horizontal superheaters, economizers, and reheaters. It will often accomplish effective cleaning where this has not been possible previously. Areas which tend to foul rapidly may be kept completely clean by increasing the length of the automatic shot cycle (it may be continuous if necessary) without disturbing boiler operation. No platforms or galleries are needed as with conventional cleaning equipment so aisle space often may be reduced.

Uniformly low draft loss and constant flue gas temperature are easily maintained because deposits are removed before they impair the thermal efficiency of the plant.

Cleaning is accomplished by thousands of steel shot that cascade over tube surfaces and ricochet from tube to tube, or through the insides of air heater tubes.

How It Works

Falling shot, spread uniformly by distributors scours the fouled area. Deposits are removed in small particles, most of which are carried away by the gas stream. Heavier particles fall into the shot hopper and recirculate with the shot until broken fine enough to pass out with the gases. Cleaning is thorough even with difficult fouling such as is found in black liquor fired boilers. The same quantity of shot will clean the entire vertical section with no limitations in height.

Operation is automatic. Shot is lifted pneumatically from the hopper to a shot storage area where it falls by gravity through retarder boxes to the distributors. Length and frequency of cleaning cycle are chosen according to the fouling rate of the area and the type of deposit.

More than 30 Diamond Shot Cleaning Systems are now in successful operation in the United States . . . some of them since 1954. This is the result of Diamond's extensive research in shot cleaning over a period of years. In Europe shot cleaning has been in use over ten years and there are more than 800 installations in highly satisfactory operation. To supplement our developments, Diamond has acquired U.S. rights to the Broman-Ekstrom System used in Europe.

WRITE FOR BULLETIN 2145. It gives you complete details on Diamond Shot Cleaning. For better, more economical boiler cleaning, the answer always is Diamond.

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LANCASTER, OHIO

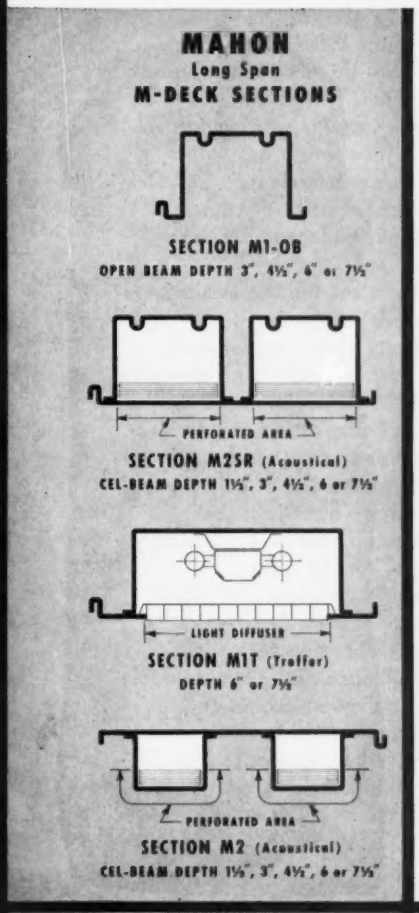
M-DECK Provides Roof Structure

M-Deck Acoustical Ceilings in the Library of the Bonlee-Goldston Consolidated High School recently constructed for the Board of Education, Chatham County, North Carolina. The school has Sixteen Classrooms, an Auditorium, Cafeteria and Shop in four buildings. Mahon Long Span M-Deck provides the Roof Structure and Finished Ceilings for the entire project, including covered, connecting walkways. **Architects:** Simpson & Savage. **General Contractor:** Hunt Construction Company.

Serving the Construction Industry Through Fabrication of Structural Steel, Steel Plate Components, and Building Products

and Finished Ceiling Combined . . .
Reduces School Cost to a Minimum!

Enough Money Was Saved on the Original Estimate to Completely Furnish a 19-Room High School



At Left: Cross Section of Long Span M-Deck Combined Roof-Ceiling with Troffer Lighting.

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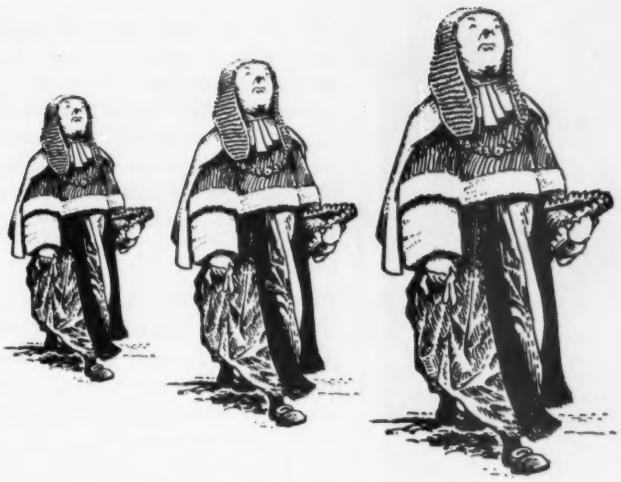


The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

The Law of Real Property: Zoning Ordinances

ZONING ORDINANCES limit the type of use to which land in specific zones of a city may be put.

The establishment of particular zones for business, residential, . . . is, in general, left to a zoning board, and there usually is a right of appeal from the decision of this board to a zoning board of appeals.

Validity of Zoning Ordinances

The validity of zoning ordinances is based on the police power of the state — the power to regulate the public health, safety, morals, and welfare. Provided there is actually some reasonable relation to public health, safety, morals, or welfare, the ordinance will be upheld (so long as it is not defective in some other respect). However, this relationship must exist at the present time; it cannot be prospective.

A further restriction is that zoning ordinances cannot validly operate retroactively on vested property rights acquired prior to their enactment, except insofar as the existing use is otherwise illegal, e.g., if it constitutes a public nuisance. To the extent that it purports to violate this principle, it is unconstitutional and invalid.

Zoning ordinances also may be subjected to constitutional attack if they fail to provide reasonably adequate standards governing the actions of the zoning board. Sometimes zoning ordinances have been held to be invalid because they provided unlimited discretion to the zoning board in the determination of what uses would be permitted in different zones.

In various instances, specific regulations of zoning boards have been successfully subjected to constitutional attack. For example, if the drawing of a boundary line is arbitrary or capricious, the regulation may be invalid. This sometimes happens when "spot zoning" is used — when a single spot is zoned differently from its surroundings, or when a single spot (an island) is arbitrarily included within a larger surrounding area in which the problems and conditions are entirely different.

Some regulations have been held to be invalid because they are unreasonable under the circumstances. This might occur where the regulation permits only residential use when the zone's only possible value is industrial. Also, a zoning ordinance or regulation which renders valuable land substantially worthless generally will be held to be unreasonable and hence invalid.

Nonconforming Uses

Since zoning ordinances cannot validly operate retroactively to prohibit an existing lawful use of property, it is general practice to provide expressly for the continuation of nonconforming uses, despite the fact that no similar uses can be newly instituted in the area. But it is not necessary that the ordinance allow the nonconforming use to continue indefinitely. If it provides for gradual elimination of the nonconforming use over a reasonable period, it will be upheld.

When a nonconforming use is abandoned, it cannot be subsequently recommenced. This does not apply, however, to temporary nonuse, as with seasonal variations, where there is no actual intention to abandon the use indefinitely.

Zoning ordinances usually limit the right of nonconforming users to make structural alterations that tend to perpetuate the nonconforming use, or change the character of the building without causing it to conform to the ordinance.

Variances

Another normally recognized factor is that there must be provisions for variances in specific instances in which strict enforcement of an ordinance would cause owners unnecessary hardship. Zoning boards of appeals usually are given wide discretion in allowing variances.

In addition to variances, there also may be exceptions under some conditions. These permit what ap-

pear to be new nonconforming uses without going through the variance procedure. However, an exception differs from a variance in that the exception is provided for in the ordinance itself, rather than constituting a departure from the ordinance because of hardship.

Judicial Review

The decisions of zoning boards and boards of appeals are not absolutely final in every respect. Like other administrative rulings, they are subject to review by the courts. Judicial review is always available if the constitutionality of an ordinance, of a regulation, or of an administrative decision is questioned.

Aside from the question of the constitutionality, the courts generally will not interfere with an administrative decision. They will not substitute their own discretion in place of that of the administrative board — unless there has been an abuse of discretion by the board (an arbitrary action). This will be reviewed by the court. Further, if the administrative board has made a finding of fact, this will not be upset by the court, provided it is based on substantial evidence. If there is no substantial evidence to support the finding of fact, the court will review it.

Procedure

Normally the procedure before zoning boards and zoning boards of appeals is not as formal as courtroom procedure. For example, it usually is not necessary to adhere to the strict rules as to the admissibility of evidence.

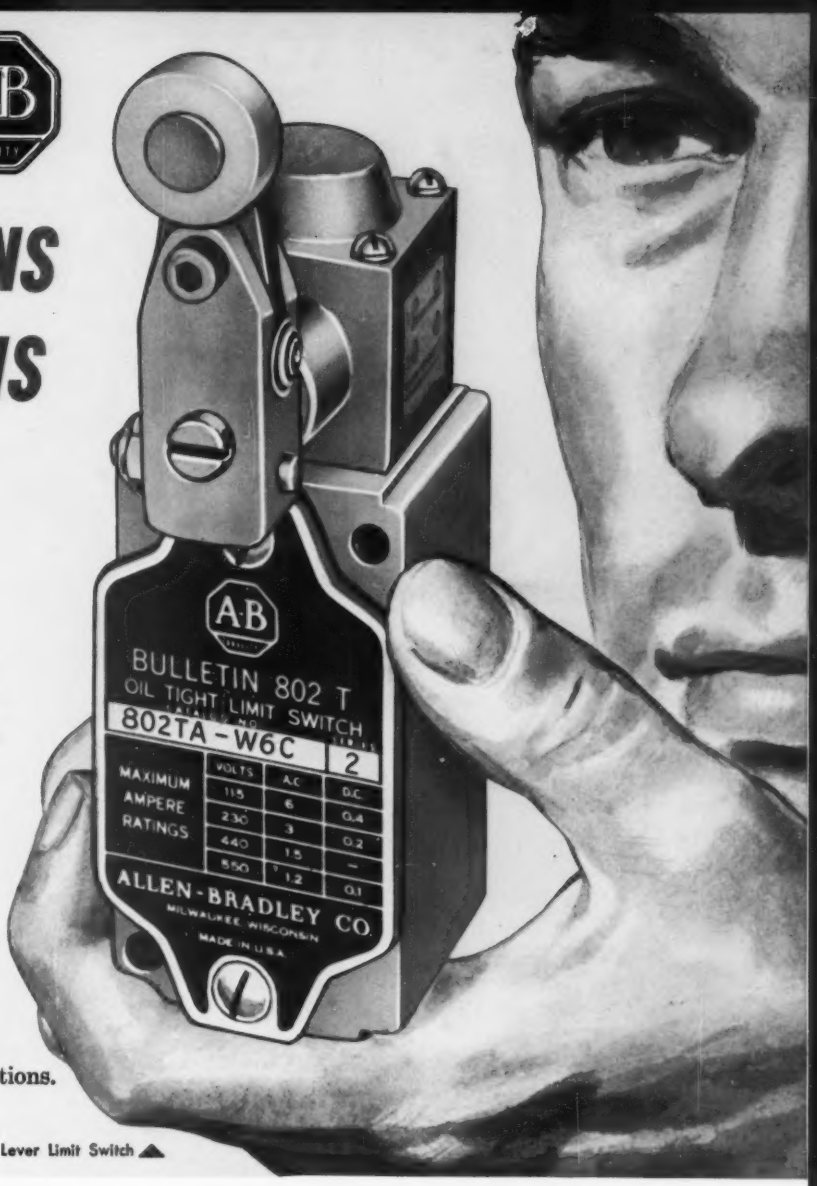
However, there are some limitations on the procedure of these boards, which are derived from constitutional law. Thus, where a decision is to be made by the board as to a specific piece of property (as distinguished from more generalized actions), the owner of the property is entitled to a fair hearing after receiving reasonable notice, under the "due process" clause of the constitution. ▲▲

MORE MILLIONS OF OPERATIONS

with Allen-Bradley Limit Switches

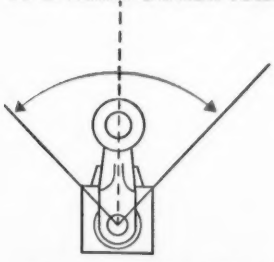
There's nothing now on the market to match the reliability and trouble free performance of Allen-Bradley Bulletin 802T limit switches. They are completely oiltight—operating heads and switch bodies are sealed against oils, coolants, and metal chips. Operators cannot become sluggish or "stick" in operation—contacts cannot become fouled. The double break, silver contacts are always in perfect operating condition—and remain so without maintenance.

Insist on Allen-Bradley—the *quality* line of limit switches that will give you *many more millions* of trouble free operations.

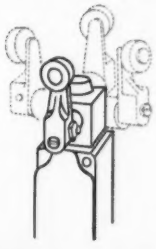


Bulletin 802T Micrometer Adjustment Roller Lever Limit Switch ▲

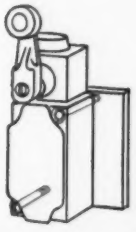
A-B Limit Switch features mean more life, more dependable trouble free service



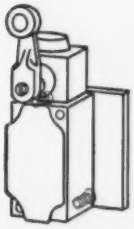
REPETITIVE ACCURACY—Unique toggle blade action assures operation at precisely the same point each time, without adjustment.



FLEXIBILITY—All operating heads can be rotated and fastened in any of four positions 90° apart.



FRONT MOUNTING



REAR MOUNTING

All Allen-Bradley Limit Switches can be mounted either from the front . . . or from the rear.

1-60-MR

SEE OTHER SIDE FOR TYPICAL APPLICATIONS ⟶

ALLEN-BRADLEY

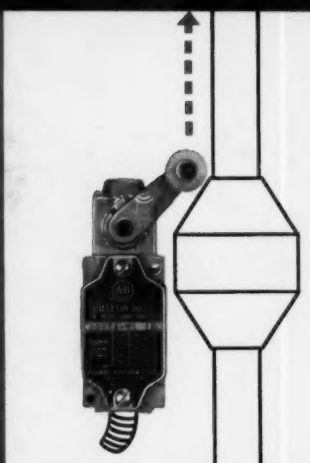
Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. ▪ In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

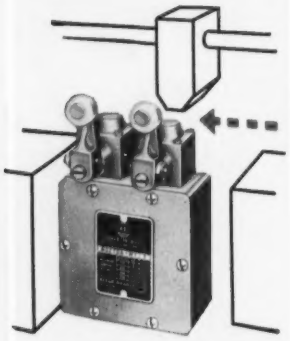
QUALITY MOTOR CONTROL

Allen-Bradley has an Oiltight Limit Switch to meet your exact needs!

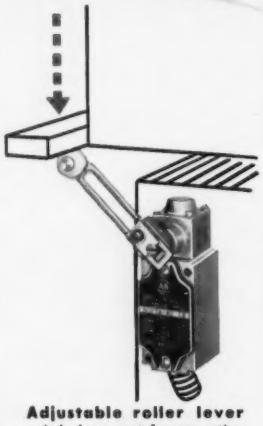
From among the wide variety of Allen-Bradley oiltight limit switches, you are certain to find the exact type to satisfy *your* specific requirements. If you do not, then please discuss *your* problem with us. A-B limit switches are available with many different levers, lever-contact actions, operating forces, and actuator motions—in spring return or maintained contact construction. A new 16-page illustrated booklet on this *quality* line of A-B oiltight limit switches is just off the press. Write for it!



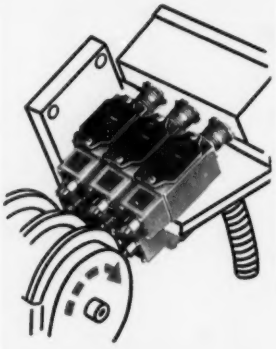
Roller lever limit switch—Here it is operated by dog on vertically moving shaft.



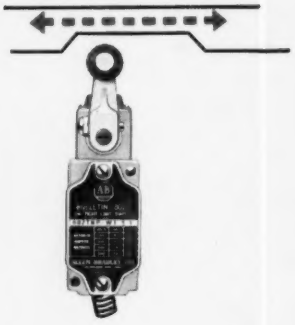
Duplex limit switch where block can also trip second switch for safety insurance.



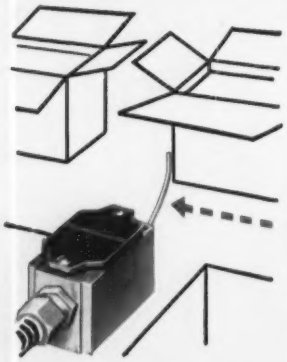
Adjustable roller lever switch. Lever set for operation at greater than normal distance.



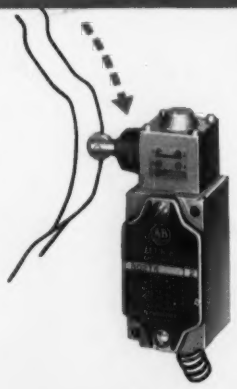
Top push roller limit switches are frequently operated by rotating cams on machine tools.



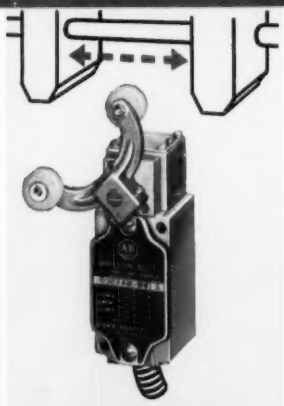
Neutral position switch—moving bar closes separate contacts as it moves each way.



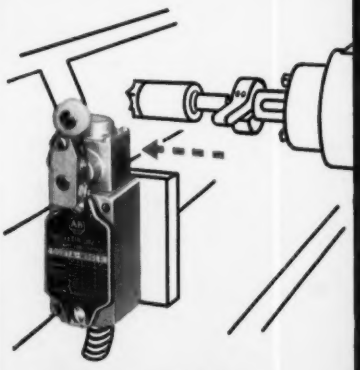
Cat's whisker limit switch is actuated by movement of lightweight units on conveyor.



Side roller limit switch, as illustrated here, is being actuated by a rotating cam.



Fork lever maintained contact switch—adjustable dogs trip one roller in each direction.



Micrometer adjustment switch for precise setting of trip point in machine tool operations.

1-60-MR

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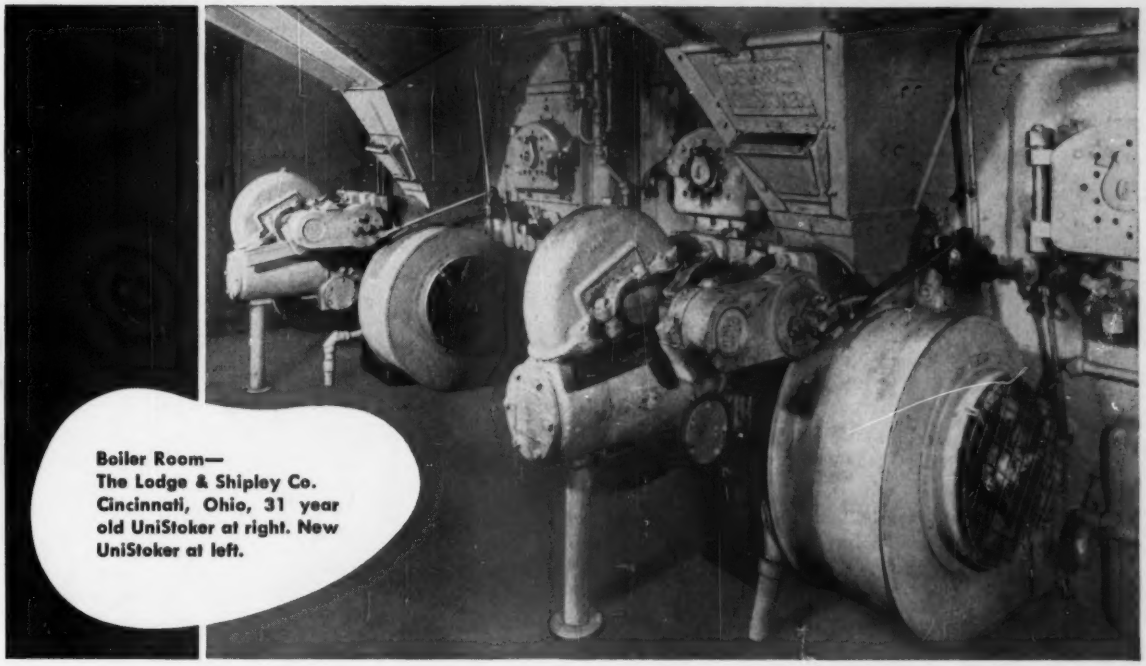
UNI-STOKERS NEVER DIE, NEVER DIE

THEY JUST GO ON... AND ON*

31 Year old Detroit UniStoker is still serving and saving



Boiler Room—
The Lodge & Shipley Co.
Cincinnati, Ohio, 31 year old UniStoker at right. New UniStoker at left.

● A Detroit UniStoker installed at The Lodge & Shipley Co., Cincinnati in 1927 performed so well and proved the economy of UniStoker firing so conclusively that another UniStoker was purchased in 1958 when added steam capacity was needed to serve plant expansion.

EVEN MORE SIGNIFICANT—the original UniStoker after 31 years of service was doing such a good job it was deemed worthy of modernization.

Some of the up-to-date UniStoker features were added to it and many more years of efficient operation are expected.

As the song says—"They just go on and on", saving as they go.

YOU can save with Detroit Stokers. Let one of our sales Engineers recommend the correct stoker for your needs.

The Complete Detroit Line of Underfeed and Overthrow Spreader Stokers provides a type and size for almost any boiler from 3,000 to 400,000 pounds of steam per hour capacity.

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Write **DETROIT STOKER COMPANY**
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District Offices or Representatives in Principal Cities

"Quote . . . End Quote"

". . . I would have you fully realize that professionalism and individualism are synonymous. Neither an engineer's creed nor the Canons of Ethics are for groups or for organizations. They are extremely personal and belong to each and everyone of us individually." — T. Carr Forrest, Jr., Dallas consulting engineer.

Gardy Loo!

"The social services in this country virtually began with sewage, in the days of Edwin Chadwick; although there are not many votes on the subject, it is high time that it was restored to something like its former primacy. The nineteenth century learned the hard way that individuals could not be left to deal as they pleased with their own slops and sewage; the vastly more overcrowded twentieth century, although medically armoured against the worse effects of communal insanitation, is only grudgingly learning that the same holds good of municipalities and even of river basins. The discharge of untreated sewage anywhere, by any authority, ought to be as intolerable to public opinion as the robust old habit of crying 'Gardy loo!' and emptying the close-stool out of the window. Inland local authorities must establish sewage farms; there is no reason, in economics or social justice, why an authority which happens to have a river or estuary handy should exonerate itself from that duty by turning its waterway into a sewer. The right kind of official policy is going to involve being very much tougher towards arguments by local authorities that it is not 'reasonably practicable' to dispose of sewage otherwise than with a communal cry of 'Gardy loo!'; it is also going to involve, eventually and civilisedly, the spending of a lot more money." — The Economist, Dec. 5, 1959.

Recruiting Practice

"It is the hope of the ASEE that this leaflet (Code for Recruiting Practices and Procedure) gets into the hands of every engineering senior seeking employment, as well as the recruiter and the college placement officer. It is designed as an aid in the development and maintenance of high ethical standards in the relations between the employing organization, the college authorities, and the college student." — W. L. Collins, Secretary of the ASEE and professor, University of Illinois, in announcing the second revision of the original code which, according to P. L. Alger, chairman of ECPD's Ethics Committee, now constitutes a supplement to the ECPD Canons of Ethics.

Frisco Transit Underground?

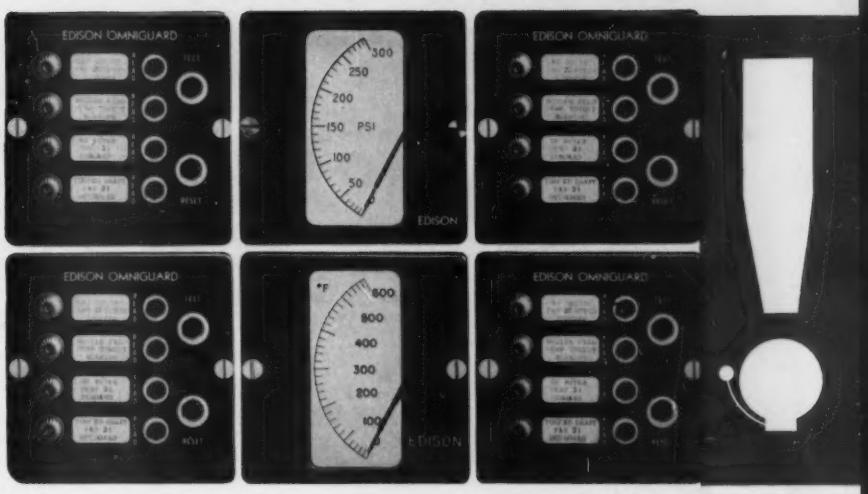
". . . [elevated structures are] less desirable than subways or routes located on private rights of way . . . [and] experience has shown that poorly planned use of elevated structures can adversely affect property values and the civic appearance for which San Francisco is famous. [Elevated structures should be considered] only on streets in excess of 100 feet in width traversing industrial and commercial districts." — A San Francisco technical committee resolution in agreement with a preliminary report submitted by the consulting engineering firm of De Leuw, Cather and Co. calling for the development of $408 million worth of transit lines in San Francisco and extending down the peninsula to Palo Alto.

Socialized vs Private Practice

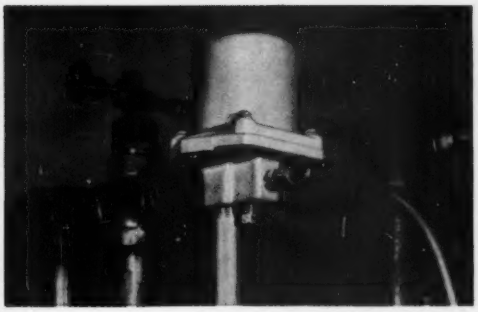
"In the development of its many programs of public works, of which defense and public road improvements are typical, government has for many years made extensive use of the facilities of engineers and architects in private practice for the planning and supervision of construction of such improvements.

". . . basically, Government has limited the provision of technical personnel in its various agencies to those required for the making of preliminary studies, for preplanning and budgeting, and for essential supervisory management and control of programs. Private practitioners have been retained to fur-

GUARD ALL CRITICAL PRESSURES AND TEMPERATURES WITH THOMAS A. EDISON LOW-COST, OMNIGUARD WARNING SYSTEM



Here is a versatile, highly-reliable continuous warning and monitoring system. By simply pushing a button on this panel you obtain a reading of *key pressure* and *temperature* points throughout your plant. In addition, this system provides instantaneous warning when pressure or temperature deviates from pre-set limits.

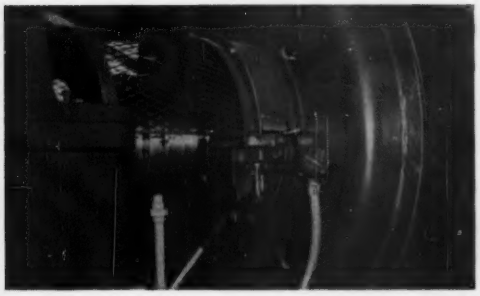


PRESSURE

With the Edison Omniguard system you can monitor gas, fluid or vapor pressure. Heart of the system is a rugged, accurate, pressure detector which converts pressure directly to electrical resistance—requires no millivolt conversion—no amplifier. For pressures under 60 PSI a precision capsule is the sensing element. From 60 to 3000 PSI special bourdon tube elements are used.

When pressure changes, resistance varies and this deviation is transmitted to the control panel. Units operate over ambient temperatures of 32° to 150°F. Control panels are available with a wide variety of scales and are equipped with both normally open and normally closed alarm contacts to operate any type of auxiliary device or to automatically shut down machinery or process.

Compact, reliable Resistance Pressure Detector transmits changes in pressure to central control panel.



TEMPERATURE

Edison Omniguard also provides reliable protection from overheating. You can monitor the temperature of bearings, gases and liquids in critical equipments or processes. Reliable Edison Resistance Temperature Detectors have no moving parts and give instantaneous warning when limits are exceeded. Unlike other systems which only scan, Omniguard is continuously monitoring. You can obtain exact readings of temperatures in all parts of your plant from one central control panel.

For greater flexibility and reliability each detector circuit is completely independent. If one circuit is damaged, all other circuits remain "on guard." When changes or additions are required they can be accomplished quickly and easily.

Rugged, accurate Resistance Temperature Detector guards against overheating of this motor bearing.

Thomas A. Edison Industries
INSTRUMENT DIVISION
86 LAKESIDE AVENUE, WEST ORANGE, N. J.

nish the services required for detailed planning and supervision of construction of the improvements...

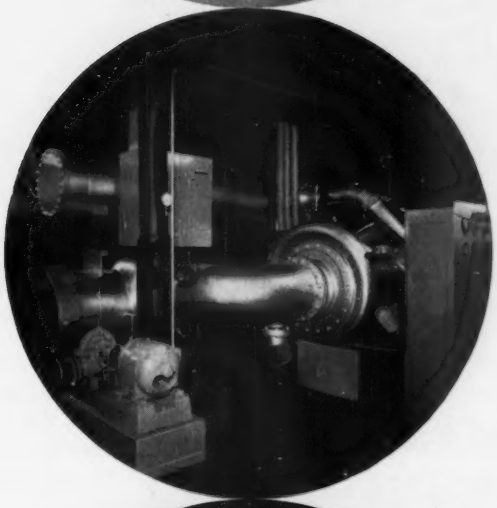
"Some 30 or 40 years ago a radically different policy first appeared, and a trend toward its widespread adoption has since advanced at a rapidly accelerating rate. By now it has been established as the policy under which many governmental agencies, in the Federal, state, and lesser levels, operate in their planning and public works. Under that policy the various agencies build up, within themselves, large organizations of civil service of other professional employees who are responsible for the provision of a complete service, including all phases of planning and supervision of construction. The policy is socialistic in its concept, and directly counter to that of free enterprise.

"Whether by coincidence or by design, recent months have brought forth a spate of official publications and public statements critical of the use of private practitioners in public works and, at least by implication, advocating the policy of complete services by organizations of public employees.

"The current records clearly indicate that many able and influential members of Congress, as well as other public officials, now believe that discontinuance of the use of private practitioners in favor of a complete service by governmental personnel would be to the public interest.

". . . The problem confronting the professions is to find ways and means by which [the Hoover Commission Task Report] findings and the recommendations [of Robert Moses] will be considered and accepted, by governmental authorities responsible for public works, and applied by them in providing for the plans for improvements undertaken for other agencies.

"Currently the subject is being given important attention by some of the professional societies, such as NSPE, AIA, CEC, AICE, ASCE, and the engineering division of



New annex to Indiana National Bank, Indianapolis (Top Illustration)
Architect: D. A. Bohlen & Son. *Consulting Engineer:* Bevington, Taggert and Fowler. *Mechanical Contractor:* R. M. Cotton Company.

Climate by Chrysler

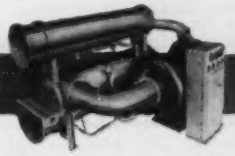
. . . cuts the cost of cooling two buildings for Indiana National Bank

The new 9-story addition to Indiana National Bank in Indianapolis is adjacent to an older 9-story bank annex which was already air conditioned. When the consulting engineers planned the cooling system for the new building, they came up with a unique way to cool *both* buildings with a Chrysler Centrifugal Liquid Chiller in the new addition as the basic unit . . . and bring the bank considerable savings in operating costs.

The new 218-ton Chrysler Chiller was also connected to the air handling equipment in the old annex. Thus, the new, extra-efficient unit operates under most economical conditions whenever air conditioning is needed in either building. The two units in the old annex are used only when additional capacity is simultaneously needed for both buildings.

What gives the Chrysler Centrifugal Chiller its extra efficiency? The exclusive true volute casing design is the answer. It delivers more tons of air conditioning per motor horsepower. (Or, if you wish, you can get a given tonnage with a smaller, less expensive motor—and save money on initial cost and operating expense.)

No matter how large or complicated the air conditioning job, Climate by Chrysler can be custom-engineered to your exact requirements. For complete information, or technical assistance, contact your local Chrysler Applied Machinery and Systems sales office.



CHRYSLER
AIRTEMP

Airtemp Division, Chrysler Corporation, Dept. X-10, Dayton 1, Ohio
In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario

ARBA, principally in the preparation of material for presentation before the hearings of the Congressional House Committee on Appropriations expected to be held early in 1960.

"The problem involved is large, and, because of its many facets, somewhat complicated. To face up to it and deal with it adequately will require the concerted and cooperative effort of all of the professions whose interests are involved.

". . . the large majority of the members of the Congress and the public officials who today look with favor upon the provision of professional service by governmental personnel are, in the light of their present information, sincere in their opinion that such procedure offers advantages to Government and the public . . .

"With few exceptions the published reports of governmental agencies do not furnish the information necessary to permit a true comparison of the costs of professional services provided by the alternative procedures. Fees paid to private consultants are readily determinable, but the total costs actually paid by the taxpayer for professional service when provided by government personnel are elusive at best . . .

"Until such figures can be made available, and compared with similarly established figures of the cost of services provided by the private practitioners, an interested member of the Congress, a governmental official, or any other person will find it difficult to escape the confusion that presently attaches to any effort to reconcile the conflicting opinions and statements of the proponents of the two conflicting policies.

". . . A most effective approach would possibly be by a Congressional directive establishing a uniform system of accounting of engineering costs, to be applied by all governmental agencies maintaining professional organizations and, for comparative purposes, to be followed by private practitioners on public works projects. It would be reasonable to expect that similar procedures would ultimately follow in the state, county, and municipal levels of Government. A uniform system of accounting established by the Federal Power Commission and followed by all utilities under its jurisdiction has operated satisfactorily for years.

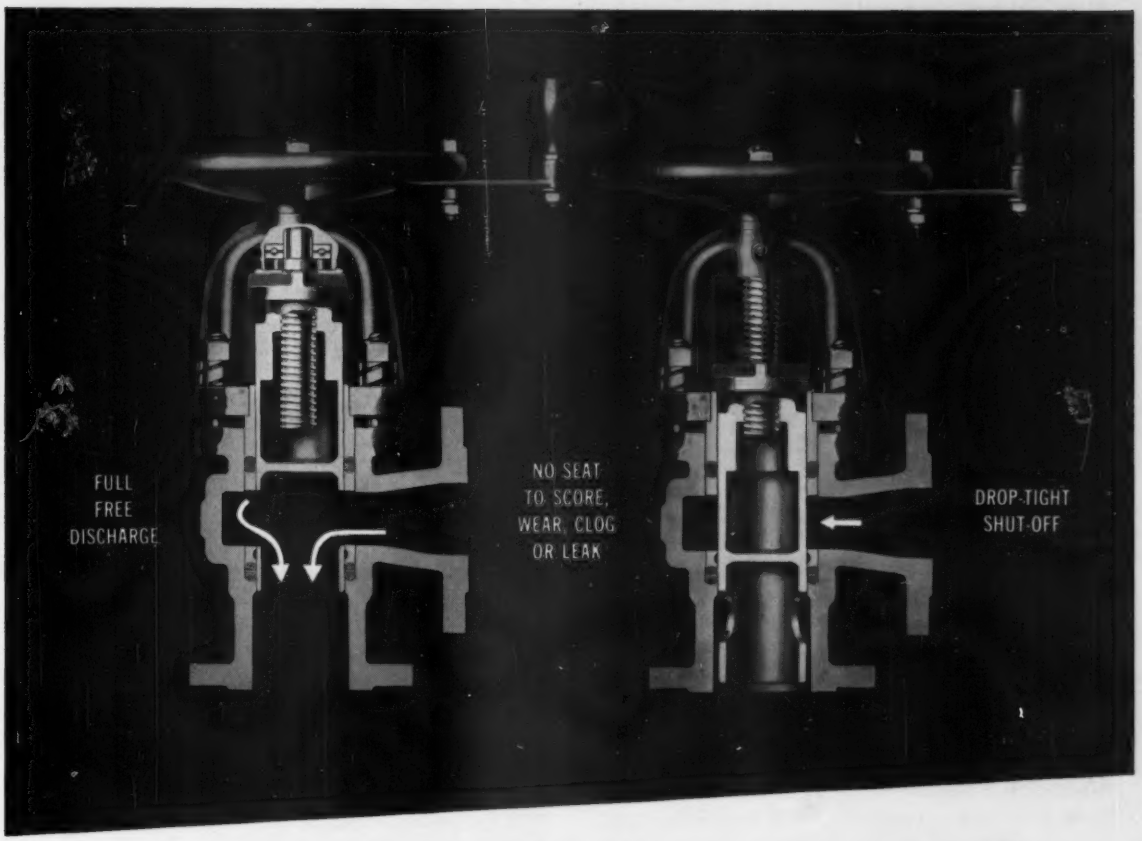
"If the members of the professions, or their societies, bring about such a procedure it will quickly show whether the interests of Government and the taxpayers are better served by the planning of public works by governmental personnel, or by the use of the facilities of private practitioners for the purpose. The private practitioners would, and should, expect to abide by the findings." — From a statement by George B. Hills, President of the Engineering Division of ARBA.

A Professional Man

"Though professional men, like other men usually have to earn their living, the value of their work is not measured by the money they earn. The compensation that comes to them is incidental to the performance of their professional services. That is why their compensation is usually referred to as a "fee" or an "honorarium," rather than as "wages" or "salaries." That is also why doctors and lawyers often take cases free of charge.

"Tawney is quite emphatic on this point. For him the essence of a profession is that, though men enter into it for the sake of their livelihood, the measure of their success is the service which they perform . . . they do not consider that any conduct which increases their income is on that account good.

"In other words, the essential characteristic of a profession is the dedication of its members to the service they perform." — Dr. Mortimer J. Adler, The Chicago Sun-Times, December 13, 1959. ▲▲



open and shut case!

...FOR TROUBLE-FREE PERFORMANCE WITH YARWAY SEATLESS BLOW-OFF VALVES

Mention Yarway Seatless Blow-Off Valves in more than 16,000 boiler plants, and you'll get solid approval—for these plants have first-hand *experience* with the dependable, trouble-free, service of Yarways.

For boiler blow-down service at all pressures up to 415 psi, YARWAY SEATLESS (in tandem) is the popular choice.

Outstanding feature is the famous seatless design—*there is no seat to score, wear, clog or leak*. Nitralloy hollow sliding plunger permits full, free discharge, yet keeps valve drop-tight in closed position. *No other blow-off valve has these features.*

Specify Yarway Seatless Valves when ordering new boilers and when replacing worn or inefficient blow-off valves on your present boilers.

Yarway Bulletin B-427 gives full information. Write for it today.

YARNALL-WARING COMPANY
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YARWAY
A MARK OF QUALITY IN STEAM ENGINEERING

A Portrait of The Man at The Top

STAFF REPORT

UNLIKE OTHER PROFESSIONS, the consulting engineer has created no public image. Even within the profession, he has not been able to come up with a clear self portrait. To help sharpen the focus of this blurred image, CONSULTING ENGINEER has gathered background data on the principals and partners who are the heads of their firms. It is reassuring, but not surprising, to find that there is no average consulting engineer — for consulting engineers, on the average, are an above average group.

CE exclusive

The Study Sample

Findings have been based on data furnished by approximately 4000 top men from as many firms. This personal information, combined with basic facts about their firms, was punched into IBM cards, and all sorting and computing was done by card processing equipment.

The men involved in this study are the top management of a considerable majority of the consulting engineer firms currently practicing in the United States. These men are from every state in the U.S. and are the products of over 250 institutions of higher learning — ranging from the ubiquitous International Correspondence School to the self-hallowed halls of the Ivy League.

Education

Through some sort of shame or inverse snobbery, 13 percent of the engineers in this survey indicated that they had some sort of degree but failed to identify it. In addition, quite a substantial group (almost 30%) referred to their bachelors, masters, or doctors degree, but failed to specify whether the degree was in engineering or in some other field of study. Another much smaller group (6.6%) proved that formal education is but one road to the top, even in engineering, for they claim no college education. The degree status of consulting engineer principals and partners is shown in detail in Table 1.

Consulting engineers are better educated than other engineers and other college graduates. In 1956 about 15 percent of all degrees awarded in the U.S. were masters, about 2 percent doctors, and the balance bachelors. In the same year, all engineering degrees awarded broke down on an identical percentage basis. However, among the degree bearing consulting engineers, 3.1 percent have earned their doctorates and a solid 28.1 percent (nearly twice the figure for other engineers and other college graduates) have their masters. Of the 102 doctorates, in the group studied, 81 were earned in just 10 large, U.S. universities, and 8 were awarded by European universities. Whether

TABLE 1

THE DEGREES THEY HOLD

(As percent of all their degrees)

Field of Engineering	*Degrees*					*Total in Field*
	BS	*BA*	*MS*	*MA*	*PhD*	
Architectural	2.5	0.1	0.3	—	—	2.9
Civil	24.5	0.1	10.7	—	—	35.3
Chemical	1.0	—	0.5	—	—	1.5
Electrical	8.0	—	3.5	—	—	11.5
Mechanical	11.2	—	6.5	—	—	17.7
Sanitary	0.4	—	0.6	—	—	1.0
Mining & Met.	0.3	—	0.1	—	—	0.4
Industrial	0.1	—	0.1	—	—	0.2
Petroleum	0.1	—	—	—	—	0.1
Not Stated	19.5	1.0	5.6	0.2	3.1	29.4
Total	67.6	1.2	27.9	0.2	3.1	100.0

TABLE 2

THE SCHOOLS THEY ATTENDED

University	Percent of Graduates
Illinois	4.05
Massachusetts Inst. of Tech.	3.87
Michigan	3.70
Purdue	3.15
Cornell	3.05
California	2.96
Minnesota	2.56
Pennsylvania State	2.40
Georgia Inst. of Tech.	2.30
Columbia	2.11
NYU	2.11
Wisconsin	1.96
Texas A & M	1.90

by design or accident, almost a third of these consulting engineers who have PhDs took advantage of the depression '30s to gain their advanced status.

Degrees in civil engineering outnumber all others among top men in private practice. They outnumber mechanical engineering degrees 2 to 1 and electrical 3 to 1, despite the fact that among engineering graduates in general, mechanicals and electricals account for about 25 percent each, while civils come to only 15 or 16 percent.

Membership in professional fraternities and honor societies is limited to a rather distinguished academic group. Since the heads of consulting firms must combine professional competence with business acumen, it is a distinct credit to their professional status that 23 percent of those who hold degrees are members of one or more of these honors organizations. In fact, 1 percent are members of three or more, and 5 percent of two.

Tau Beta Pi claimed the most members, with 14 percent of the group in this one honor society. Chi Epsilon, the civil engineering fraternity, claims 5 percent of these firm heads.

Where Did They Go To School?

The degrees of these consultants come from better than 250 different schools, but 71 percent of all the degrees were earned in 56 large colleges or universities. Narrowing the field a little further, more than a third of these principals and partners are graduates of only 13 universities, and 15 percent came out of the five midwestern giants – the Universities of Illinois, Michigan, Purdue, Wisconsin, and Minnesota. Table 2 lists the 13 leading universities and the percentage of top consulting engineers who are graduates of each.

The list of schools selected for advanced degree work is strongly affected by the metropolitan location of most engineering practices. For example, a third of the PhD's were earned in and around New York City. Type of school and reputation also counts, for MIT alone graduated almost a fifth of the total. Masters degrees reflect the same influences, but to a lesser extent, for the fifth year in residence is frequently felt to be almost routine in many engineering schools and often is made financially feasible through teaching fellowships and research grants.

It would be interesting to discover just what led these currently top men into their chosen field. Certainly there is little traditional glamour to en-

TABLE 3

WHERE DID THEY COME FROM — WHERE DID THEY GO?

Region Now Practicing In	Graduates of: Univ. of Calif.-% (90)[1]	Georgia Inst. of Tech.-% (54)[1]	Mass. Inst. of Tech.-%	Univ. of Minn.-%	Texas A&M-% (94)[1]	Univ. of Illinois-% (85)[1]	Univ. of Wash.-% (80)[1]
New England	2	0	32(24)[2]	0	0	0	2
Middle Atlantic	0	6	25	4	2	9	2
South Atlantic	1	68(47)[2]	7	2	5	6	5
East South Central	0	9	3	0	0	4	0
East North Central	1	3	12	10	0	55(43)[2]	2
West North Central	1	4	3	74(66)[2]	0	11	13
West South Central	0	8	5	1	89(85)[2]	4	0
Mountain	3	1	4	1	2	3	0
Pacific	92(90)[2]	1	9	8	2	8	76(59)[2]

[1] *Percentage of engineering graduates who enrolled as in-state students*

[2] *Percentage now practicing in same state as the college or university which they attended*

tice them, for most engineering undergraduates are unaware of private practice. Strangely, these top men tend to graduate in batches. Of the 4000 men in the study, a surprising number received degrees in the same year, from the same school. For example, the University of California awarded eight masters degrees in 1941 to men who now head eight different consulting engineer firms. Practically all of the engineering schools graduating 20 or more of these men showed a remarkable number of similar groupings at each degree level. Were these men influenced by an outstanding teacher? Did they come under the influence of an alumnus who was a successful consultant? Did one of the group tell his fellow students of the benefits and opportunities of private practice? Unfortunately, the survey cannot give the answer. It can only show that certain engineering students, as parts of recognizable groups, must have fallen under some simultaneous influences that directed them into private practice.

Where Did They Go After School?

To learn a little about the dispersion patterns of these engineers following graduation, six well known schools were selected in different areas of the U.S. Minnesota, a seventh school, was added when it became apparent that the University of Illinois might not be typical of the Midwest. Graduates of these seven schools are now practicing in all but eight of the 50 states. Their regional locations are shown in Table 3.

Records from these universities indicate that the University of California draws most heavily on its own residents, with 90 percent of the engineering graduates coming from within the state. Coincidentally, it also shows the greatest holding power, for 90 percent of the consulting firm heads who graduated from the U of C are now practicing in California. At the opposite extreme, the University of Illinois, which normally has about 85 percent of its engineering graduates from within the state, was able to retain only 43 percent of its engineer graduates who are now heads of consulting firms.

Massachusetts Institute of Technology shows only a 24 percent holding power, but its excellent reputation allows it to attract a more cosmopolitan enrollment which tends to scatter widely over the entire U.S. after graduation. Georgia Institute of Technology, with 54 percent of its engineering students from within the state, has held only 47 percent of its graduates who now head consulting firms. However, the regional flavor of this school is evident from the heavy concentration of graduates who have set up their consulting firms in the southeast. Next to the U of California, Texas A & M and the University of Minnesota seem to do the best job of holding their local boys who are now consulting engineers.

Where Are They Registered?

Slightly over half of the heads of consulting firms are registered in more than one state. More than 10 percent are registered in 5 or more and 2 percent in 9 or more. Thus, the consultant is a peripatetic practitioner. While the demands of out-of-state practice may have made it necessary for some heads of firms to establish a definite program of registration in various states, it is more than likely that some of the registrations were obtained in the course of early employment. Thus, as a group, consulting engineers give evidence of broad engineering experience in many locales. It is probable that even the group that is registered in only one state is not so confined in practice, for other partners in the firm may be registered in other states. Table 4 gives a complete breakdown by number of states in which engineers are registered.

How Old Is The Top Man?

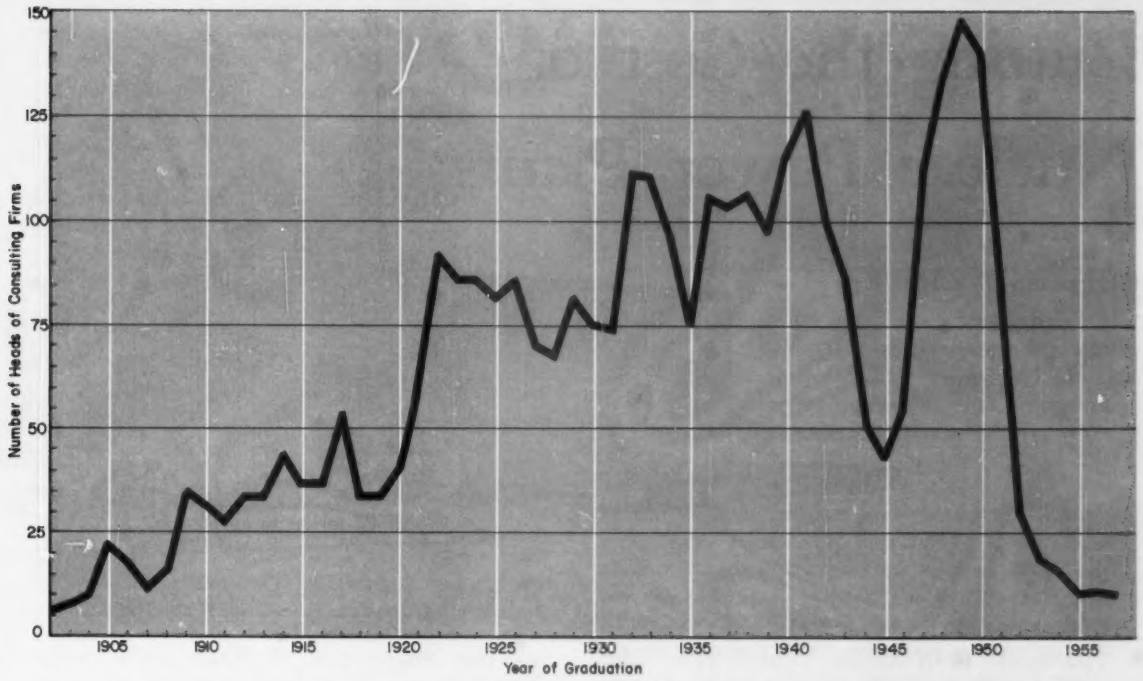
Based on the year they graduated from college, these principals and partners of consulting engineer firms have an average age of 47. The median age is 46, indicating a relatively good balance between the number who are older and the number who are younger than average. However, a look at the medians for quartile groupings gives a different picture. The oldest quartile of the group includes an age range from 56 to 79, with a median of 62. The second quartile has an age range from 46 to 56, with a median of 49. The third runs from 38 to 46, with a median of 42. The bottom quartile, which takes in the youngsters of 24 to 38, has a median of 33.

Since most top men in consulting firms can work as long as they like, there is little tendency to retire at 65. As a consequence, almost 10 percent of these top men are at or above that common retirement age. Over 100 men (2.5%) are still active at

TABLE 4

WHERE THEY ARE REGISTERED

Number of States	*Percent of All Heads of Firms*
1	49.4
2	21.5
3	11.2
4	6.5
5	4.7
6	2.2
7	1.7
8	0.6
9 or more	2.0



Number of present heads of consulting firms who earned degrees in each year from 1902 to 1957.

age 70 or above. On the other end of the scale, only 187 men (4.7%) 30 and under head firms.

The number of these men from the graduating classes of 1909 through 1919 remained almost the same for each of those ten years. The next two years, 1920 and 1921, show increasing numbers, and the figure then leveled off from 1922 to 1932. Graduates of the '30s make up almost one-fourth of the men in this study, with 1940 through '42 continuing as good years. Few heads of firms were graduated during the years of World War II, but starting in 1947, the number increased, with the 148 (3.7%) graduates of 1949 currently the largest group to come out of any single class. There were 141 from the class of 1950, and thereafter the numbers decline, though this will change as graduates of these recent classes gain in age and experience.

In Which Fields Do They Practice?

Most consulting engineers earned a degree in one of the traditional fields of engineering. In actual practice, however, almost 60 percent of all consultants practice in more than one field. There are actually 51 combinations of two or more fields in which this top group claims to practice. For example, 9.5 percent combine mechanical and electrical engineering, 5.5 percent civil-mechanical, and 9.5 percent civil-mechanical-electrical. Thus, while the number of top consultants with degrees in civil engineering is considerably greater than for both mechanical and electrical, the difference is significantly reduced by the time the consultant sets up his own firm. It is evident that the consultant looks upon engineering as a broad profession rather than a number of parcels of specialized knowledge.

Is He a Joiner?

As a joiner, the consulting engineer is about on a par with other professionals and business leaders. This is not because of lack of opportunity, for some consulting engineers are members of as many as six major national engineering organizations plus one or two local or regional groups. However, the average consulting firm head belongs to 1.2 national engineering organizations and 0.7 local or regional. There are, however, some mavericks who refuse to join any organization. They form a recalcitrant 10 percent of the total and are matched in size by another group which belongs to local organizations only.

Only 5 percent of the group are really big joiners, with three or more major national organizations to their credit. Just a little more than half of all heads of consulting firms are members of one or more of the Founder Societies, while N.S.P.E. claims almost an equal number. ▲▲

Cutting the Cost of Nuclear Power Plants

CHARLES T. CHAVE
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Nuclear Projects Division
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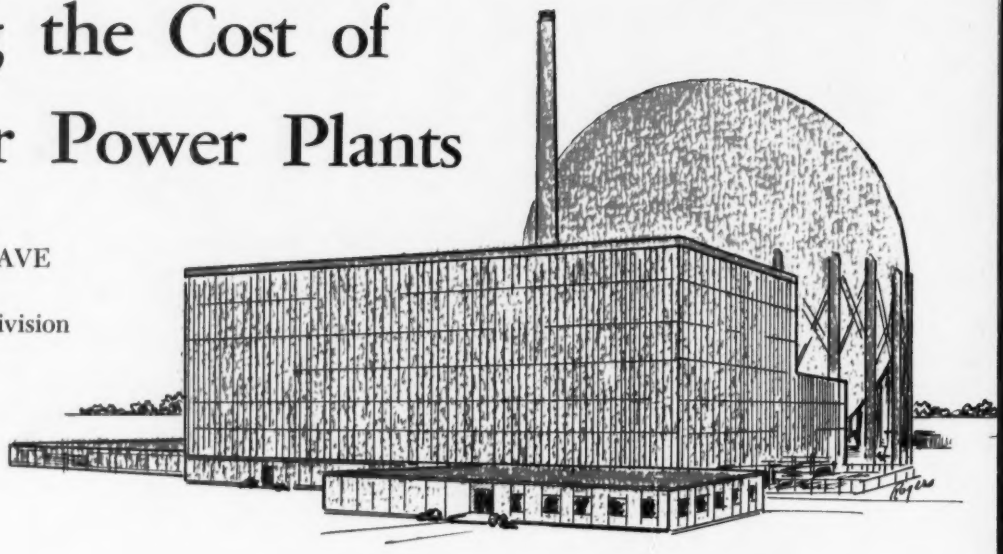

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THE DIRECTION that the design of water-cooled reactor power plants should take now can be seen a little more clearly than it could a few years ago. Anyone who has made an estimate of the cost of one of these plants will be struck by the fact that the power generating portion of the plant costs a lot of money when compared to the equivalent portion of a combustible fuel burning installation.

Distribution Costs

If an over-all unit plant cost of $260 per kw is assumed for a 150 Mw electrical plant, this unit cost can be split between the reactor plant and the power generating plant. The power generating portion will cost about $130 per kw, or about a half of the total. This figure may be on the high side by $10 or $15, depending upon what is provided, but it is reasonably representative.

Many people, recognizing this, have struggled to develop high temperature steam by liquid metal cooling, gas cooling, and lately, by partial steam cooling, resulting in superheating of the steam from a reactor. Hot steam results in a lower first cost power plant, entirely aside from the increased efficiency which also follows, and the reason for this is perfectly simple – less steam flows through the turbine to generate the same power. Furthermore, a saturated steam machine has moisture problems, including increased blade erosion and somewhat reduced bucket efficiency.

What has plagued engineers in the past, however, has been that any attempt to increase steam temperature in a reactor has appeared to result in a more expensive reactor design. There certainly seem to be real problems involved in getting the nuclear fuel up to a sufficient temperature to result in hot steam. So, there has been much hot air about hot steam but very little has been done about it. In the design of pressurized water reactors, steam pressure generally has been limited to 600 psi. A departure from this practice, however, appears to be the road to better economics.

Plant Efficiency Is Goal

With an increase in the turbine-generator plant efficiency, rather remarkable savings can be made in both the operating costs and the unit capital cost. Suppose, once again, we design a water-cooled reactor plant costing $260 per kw and operating at 25 percent thermal efficiency. Suppose, further, that the reactor is rated at 600 thermal megawatts, resulting in the generation of 150 electrical megawatts. If efficiency can be increased to 30 percent and electric generating capacity added at $100 per kw, it is possible to come up with 180 electrical megawatts at an over-all cost of about $233 per kw, without increasing the reactor plant power rating. It is obvious that any additional capacity through an increase of efficiency at a unit cost of less than the over-all unit cost of the plant must result in an economic improvement.

The question is how to increase the thermal efficiency of a water-cooled reactor plant. Steam temperature, for example, could be increased by superheating. Steam pressure also could be increased. An increase of pressure has a rather interesting effect as shown by Table 1. If this tabulation is

studied, it can be seen that, at the 400 and 500 psi pressures, the sort of conditions are found that are sought with superheating of either the fossil fired or the nuclear variety. Some of the intermediate conditions begin to resemble what might be obtained from high temperature coolants. At the top of the tabulation, there is an achievable goal—most definitely for a boiling water reactor but also for a pressurized water reactor.

The example given of the reduction in capital cost showed a reduction from $260 per kw to $233 per kw, or a saving of $27 per kw. What actually is the chance of cutting the cost of the reactor plant by this $27 per kw?

First, it is necessary to look at the percentages of the over-all cost of a nuclear power plant represented by this expensive equipment. These figures are given in Table 2. At $260 per kw, this total of 25 percent represents $65 per kw. If a reduction is attempted on the reactor portion of the plant of $27 per kw, the cost of this high pressure equipment must be cut by 40 percent, which is not very likely, even if the design pressure is cut in half. It follows, therefore, that the best direction in designing a water-cooled reactor plant is to go up in pressure.

Reheat Possibility

For a long time, many engineers have ignored the potentiality of reheat. With throttle pressures of 1000 psi and higher, it becomes important. Saturated steam turbines with 500 psi throttle steam require moisture separation at about 50 psia. At 1000 psi throttle pressure, two extractions for moisture separation would be required. However, if moisture is separated at 200 psia, and then the steam is reheated to within 25 F of the throttle temperature with throttle steam, the second moisture separator can be omitted. It has been proved that this cycle (see Fig. 1) will give 34.5 percent thermal efficiency with four stages of feedwater heating and 1.5-in. Hg back pressure.

Not only does efficiency increase, but the turbine becomes more conventional. Except for the high pressure end, it is no longer a wet steam machine. This is the kind of performance one gets from 1400 psia at 1000 F, straight condensing, with 80 percent turbine efficiency at 1-in. Hg back pressure.

TABLE 1
Straight Condensing, 80% Turbine Efficiency, 31% Thermal Efficiency, 1-in. Hg Back Pressure

Pressure, psia	*Required Temperature, °F*
1000	545 (sat.)
800	640
600	790
500	880
400	980

TABLE 2
Reactor Equipment % of Total Plant Costs

Reactor	8%
Steam Generators	8%
Pumps	3%
Main Coolant Piping	5%
Miscellaneous	1%
Total	25%

Boiling Affects Design

If the throttle pressure can be raised further, even better results may be achieved. How can a reactor designer achieve this desired result? It has been known for a long time that the first step in this direction is to permit a pressurized water reactor to boil. There is no problem with the boiling water reactor in this respect because it is designed to boil (though it does offer other problems), but with a pressurized water reactor, designed to operate at 2000 psi, boiling will permit a substantial increase in average coolant temperature – to around 600 F. However, our design efforts are limited because we are not permitting any more than the hottest channel to boil, and still have to deal with hot channel factors.

If we permit the reactor coolant to boil, we have the problem of designing a reactor of sufficient size but with practical dimensions and low enough weight to permit it to be shipped. This means power peaking must be reduced and power distribution flattened. It has been recognized for a long time that zoning the core will assist in doing this. Power output must be increased by packing more uranium into a given sized vessel and reducing the water to metal ratio. Apparently, this design procedure will provide beneficial results, since with faster neutrons, stainless steel cladding materials can be tolerated.

When a reactor like this is built, with lots of uranium packed in it, the problem of reactivity control may be met in three ways. First, we can use a multiplicity of control rods, and everyone will admit this is a colossal nuisance and very expensive; secondly, we can go to chemical poison, and this becomes not a colossal nuisance but a supercolossal nuisance; and thirdly, we can design control rods with more worth, and use a reasonable number of them. If a control element is made with a fuel element that can be withdrawn from

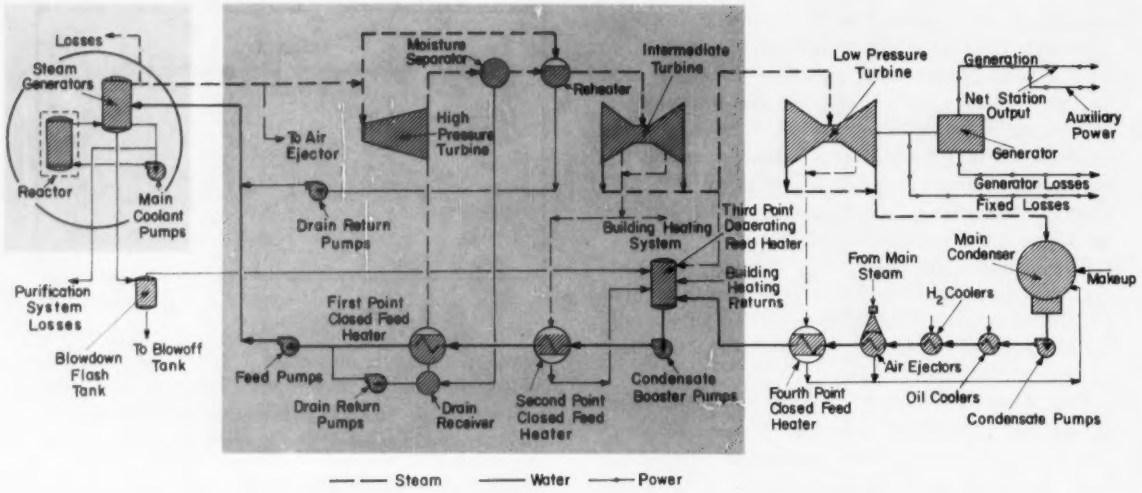

Fig. 1 – Typical flow diagram showing use of single moisture separator combined with a reheat cycle.

the reactor, at the same time inserting a poison element connected to it, the desired result can be accomplished. In this way, a reactor can be designed that can be operated with the least poison in the core from the outset.

Facing the Problem

With design concepts like these, the pressurized water reactor looks pretty good. Some people favor boiling water reactors, but others view with considerable alarm the need to use dual circulation, which would appear to turn the boiling water reactor into a pressurized water reactor possessing certain undesirable features. Producing a large amount of power with reduced secondary steam pressure seems to be a decided detriment from the point of view of achieving the maximum turbine plant efficiency.

In any event the reactor plant and the turbine plant cost too much and something must be done to reduce this cost – and there is not too much that can be done to a turbine plant designed to run on saturated steam except perhaps to find out some way to use a 3600-rpm turbine.

Field for Economies

Looking again at Table 2, we note that the expensive reactor equipment costs about 25 percent of the total plant, or 50 percent of the reactor portion of the plant. It now would seem that the easiest place to start swinging is on the other half of the reactor, which consists of shielding, vapor containment, and auxiliary systems.

All of these plants have primary loop purification systems involving ion exchange, bleeding out and pumping in, and adding hydrogen, as illustrated in Fig. 2. This is a fine field for economies. If we cannot purify the primary loop because crud deposits in the equipment before it gets to a bypass purification system, we might as well recognize where we are licked and plan on some other scheme, such as periodic decontamination.

There is one nuclear power plant that has a gas recombining system although it is operating on light water, and the gas being recombined to water is hydrogen. The question is, "Why?" This is not done any more, but it illustrates the point that much of what was thought necessary probably can be eliminated.

Too often the statement is heard that vapor containment costs only $20 or $30 per kw, and since it is in the order of 10 percent of the total cost, why

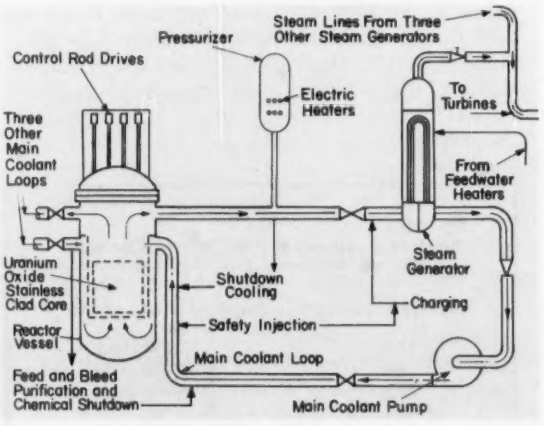

Fig. 2 – Simplified flow diagram typical of reactor plants having primary loop purification systems.

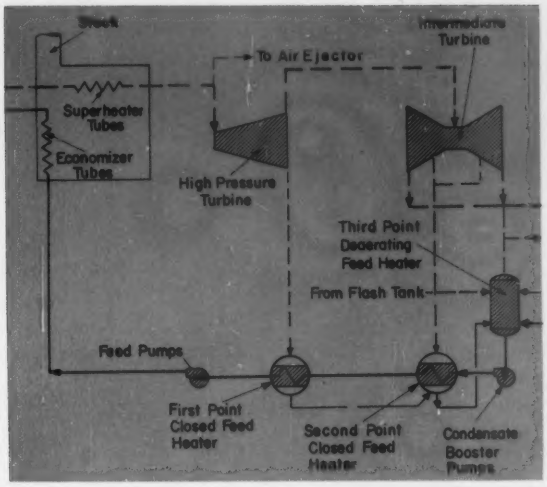

Fig. 3 – Typical flow in coal fired superheater section.

worry about it? The fact is that in order to get nuclear power plants down to a reasonable cost, we must worry about even 1/2 of 1 percent. If this were not done in ordinary combustible fuel fired plants, they too would cost well over $200 per kw. For example, there is mention of less expensive materials, such as cast stainless piping, cast fittings, and even of carbon steel, and it is possible we will get around to using carbon steel a great deal in the future on water reactor plants.

By intelligent specifications and careful buying, much money can be saved. Perhaps as much saving per kw can be made this way as can be effected by the increase of efficiency.

Layout Can Bring Savings

Of course, a great saving can be brought about by intelligent layout of the plant. This can be handled by good design so that the plant will continue to last for its full 30 or 40 years of projected life without excessive maintenance. Designers should keep in mind that dollars spent today are gone, and they should learn something about figuring odds so that there is a chance of saving dollars today – and not spending them tomorrow either.

Studies indicate that the result of all of this careful design would be a water-cooled reactor plant built at current costs for less than $200 per kw. With a capital cost like that, the generating cost can be brought down to about 7 1/2 mills per kwh on a current cost basis. Projecting into the future with escalation and interest during construction, this would mean a generating cost of about 8 1/3 mills four years from now.

How does this compare with competition from combustible power burning plants? Current figures for a coal fired plant in a high cost industrial area would run as follows:

Capital Cost	$150 per kw
Fixed Charges	14%
Load Factor	80%
Fuel Cost	30¢ per million Btu
Heat Rate	9500 Btu per kw
Fixed Charges	3.0 mills per kwh
Fuel Cost	2.8 mills per kwh
Other Costs	0.5 mills per kwh
Total	6.3 mills per kwh

These figures are made on 80 percent load factor, which no one can attain for long. As the load factor drops, the nuclear plant will suffer by comparison. However, the nuclear plant will gain in advantage as combustible fuel costs rise.

A Conventional Superheat

If a water-cooled reactor plant can be built for under $200 per kw, there is one more step to be considered. There is not much immediate hope for the nuclear superheater or the hot steam producing reactor, but it is simple to superheat steam from a reactor plant by burning fuel (see Fig. 3). What would be the result? We could expect at least 50 percent more power from the same plant without in any way adding to the cost of the reactor portion. If we can add the superheating plant and the extra generating capacity at $80 per kw, it means that we can bring the over-all cost of the entire power station down to about $160 per kw.

In addition to this, we can effect a substantial reduction in operating cost. The heat rate for the combustible fuel portion of the plant conservatively would be 8000 Btu per kwh, and, using fuel at 40¢ per million Btu, we ought to get generating costs of about 5 mills per kwh from this portion of the plant. If we generate 2/3 of our power at 7 1/2 mills, and 1/3 of our power at 5 mills, the over-all cost is 6.67 mills per kwh. This is getting pretty competitive in some areas today. The conclusion, therefore, is that if we accomplish all design changes mentioned, we should be able to have competitive nuclear power as soon as we can construct a plant on that basis.

Other Factors

But there still are problems. First of all, generating costs are based on fuel burnup costs we cannot be fully sure of for the long run. Secondly, the costs mentioned include nothing for research and development. Even the familiar pressurized water reactor still requires research and development to confirm the advanced designs described here. These costs look like $10 to $35 per kw. Either industry must absorb them, or research must be considered a proper field for governmental support. ▲▲

The Economic Outlook 1960

DR. JULES BACKMAN
Professor of Economics, New York University

As we cross the threshold of the 1960's the half-trillion* dollar national economy is about to become a reality.

A FURTHER EXPANSION in business activity seems certain for 1960. The main question is how will strikes affect the timing of the expansion? A renewal of the steel strike late in January or the development of a crippling railroad strike in the spring could influence the pattern of economic activity throughout the year. However, they should have little effect upon the total volume of business that is anticipated for 1960.

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In Retrospect

A brief look backward at 1959 is necessary to appraise the outlook for 1960. During the first half of 1959 the economy experienced a continuation of the vigorous recovery from the 1957-58 recession. A few key figures will highlight the dramatic advances that developed.

¶ Gross national product rose from an annual rate of $434.5 billion in the second quarter of 1958 to $484.5 billion a year later. Part of the rise early in 1959 reflected inventory accumulation in anticipation of a steel strike.

¶ This rise in dollar volume reflected practically no price inflation. Wholesale prices and consumer prices recorded little change between the spring of 1958 and the spring of 1959. The construction cost index rose by 20 percent in the same period.

¶ Industrial production rose from 126 in April 1958 to 155 in June 1959, a rise of 23 percent.

¶ Total employment in the second quarter of 1959 was 2.1 million higher than a year earlier; unemployment was reduced by 1.4 million.

This is a typical pattern for the first 12 or 15 months of recovery. Normally, as the period of recovery progresses, the rate of rise tends to slow up. The steel strike brought the advance in economic activity to a halt. During the first two months of the strike there were only minor repercussions — particularly upon railroad traffic, ore, and related industries. But as steel inventories were drawn down, the adverse impact of the strike was experienced in an ever-widening circle of industries. Automobile production was a major casualty. A number of construction projects were affected. Other heavy goods industries were also increasingly hurt. Since it takes time to fill the pipelines, the adverse effects continued to be experienced in many of these industries even after the steel strike was halted by court injunction. This held down business activity in the fourth quarter.

The over-all impact of the steel strike in our economy was reflected in the decline in gross national product by $5.9 billion, at annual rates, in the third quarter of 1959. This decline reflected entirely a shift in inventories from an annual rate of accumulation of $10.4 billion in the second quarter to a liquidation rate of $1.0 billion in the third quarter. The changes between the second and third quarter are shown in Table 1.

The fact that final demand (total gross national product less inventory changes) rose by $5.5 billion in the third quarter attests to the underlying strength in the economy. Of course, these averages

*Throughout this article "billion" is used to indicate a thousand million, as in accepted U.S. usage. "Trillion" means a million million, the equivalent of the "European billion."

for the third quarter conceal the moderate declines that were developing in some industries in September and early in the fourth quarter.

The steel strike has resulted in the postponement of some production from 1959 to 1960. Projected automobile production for the fourth quarter appears to have been cut by one-third. Some 25 to 30 million tons of steel ingot production was lost. These losses in production, and a number of others, will be made up in 1960.

The aftermath of the steel strike will be reflected in a significant stimulation of total economic activity in the first half of 1960. (If the steel strike is resumed when the Taft-Hartley injunction ends late in January, the postponed volume will be produced later in the year.) Inventory rebuilding and a catching-up for production lost in the automobile industry and in other steel-using industries could give the first half of 1960 boom-like proportions. Thus, to an appreciably greater extent than is usual, the 1959 experience will have a significant impact upon 1960 results.

Construction in 1959

Total new construction in 1959 was greater than in 1958. However, the total was pointing downward in the last quarter of the year. Thus, total new construction in 1959 is estimated at about $54.0 billion as compared with $49.1 billion in 1958. Nevertheless, in October the rate was only $50.8 billion. A special study made by the U.S. Department of Commerce indicated that this decline was attributable in part to the steel strike. The uncertainties attending the strike also affected new contract awards so that its effect will be experienced for several months.

Total new construction rose moderately during the first half of the year, reaching its peak in May, and then turned sharply downward. The variations are summarized in Table 2.

Nonresidential building was sustained largely as a result of the expanding volume of expenditures for plant and equipment. The steady decline in public construction from its peak level of $18.1 billion at annual rates in February 1959 reflected a combination of forces: the completion of many Federal projects started at the bottom of the 1957-58 recession, the economy drive by the Federal government, the steel strike, fiscal problems at the state and local level, and tighter money. A significant part of the decline in this area, it should be noted, occurred prior to the steel strike.

Residential housing was at an annual rate of 1.4 million private starts in the early part of 1959. A tightening up of the supply of mortgage money and a rise in its price was accompanied by a fairly steady decline to a rate of less than 1.2 million private starts in October.

Construction costs rose during the year by about 3 percent after a period of relative stability from May 1957 to January 1959.

Expanding Forces

The most powerful stimulus to economic expansion in 1960 will be found in new business investment, particularly for new plant and equipment and in inventories. Other expanding forces include a further rise in state and local government spending, higher consumer disposable income, and an expanding volume of automobile production.

Investment in New Plant and Equipment

During 1959 investment in new plant and equipment reversed part of the decline experienced during the 1957-58 recession. According to the SEC-Department of Commerce surveys, the trend, in billions of dollars at annual rates, was as follows:

1957, third quarter	37.8
1958, third quarter	29.6
1959, first quarter	30.6
1959, second quarter	32.5
1959, third quarter	33.3
1959, fourth quarter (estimated)	33.9
1960, first quarter (estimated)	34.5

Total investment in plant and equipment was slightly less than $34 billion for the year. The McGraw-Hill survey for 1960 projects a rise of about

TABLE 1

Changes 2nd Quarter — 3rd Quarter 1959 In Billions of Dollars

Personal consumption expenditures	+ 2.1
Net export of goods and services	+ 1.8
Government purchases	+ 0.7
Inventories	− 11.4
Total construction	0
Producers' durable equipment	+ 1.0
Gross national product	− 5.9

TABLE 2

New Construction in Billions of Dollars (Seasonally Adjusted Annual Rates)

	Dec. 1958	May 1959	Oct. 1959
Residential	20.8	23.8	21.6
Nonresidential	15.6	15.8	15.4
Federal, state, & local	17.1	17.0	13.8
Total	53.5	56.6	50.8

10 percent. Since it is probable that the total will be expanding throughout the year, the previous record level of $37.8 billion should be exceeded in the latter part of 1960.

Governing Factors

The increase in the investment in new plant and equipment is being stimulated by several factors. The rise in sales has created an optimistic attitude in the business community. In addition, corporate profits have risen sharply, and undistributed profits, which are available to finance new plant and equipment, are reaching record totals. A large cash flow from depreciation charges also facilitates financing of these new plants.

A high rate of research and development expenditures, which could exceed $10 billion in 1960, is creating a demand for new plant and equipment. Old equipment is being made obsolete by breakthroughs in technology. In addition, as new products are developed, it is necessary to create new factories to produce them.

The steady rise in labor costs provides an additional incentive to substitute machinery wherever that is possible. A considerable part of the expenditures for new plant and equipment is reported to be for modernization rather than expanded capacity. A combination of these forces will continue to provide a stimulus to expansion in the next year. However, because of the broad base of capacity created in the previous boom, this expansion probably will not erupt into boom-like proportions.

Inventories

The modest decline in gross national product in the third quarter of 1959 was attributable to the shift from a rapid rate of inventory accumulation to liquidation. In part, this liquidation represented the use of inventories accumulated in anticipation of a steel strike. This accumulation undoubtedly overstimulated the economy last spring and resulted in a higher level of activity than would have been attained in the absence of strike fears.

It seems clear that in steel-using industries, inventories were drawn down below normal levels. In the first half of 1960, assuming no new steel strike of long duration, inventory accumulation should be resumed at a rate in excess of $5 billion. This will mean a significant stimulus to production and to the number of available jobs. A rebuilding of inventories in the steel, automobile, and other heavy goods industries will provide a powerful stimulus to economic activity at least in the first half of the year. The steel industry may require a longer period to make up for this lost production. A renewal of the steel strike when the Taft-Hartley injunction ends could result in extending this period of inventory rebuilding.

One important point must be kept in mind in connection with inventory rebuilding. It usually leads to a level of activity higher than warranted by underlying forces in the economy. After the inventories are rebuilt, some reduction in output develops. Thus, inventories probably will shift from an expanding to a negative force in the latter part of the year. The exact timing will depend upon whether or not a resumption of the steel strike occurs.

State and Local Government Spending

Despite some fiscal problems, state and local spending for goods and services has been rising at an annual rate of about $3 billion for the past five years (see Fig. 1). A continuation of this rate of increase seems probable although some slackening in the volume of school construction is taking place. However, further rises in compensation for the government employees seem assured.

Consumer Disposable Income

Despite the steel strike, personal income showed only a nominal change in the third quarter of 1959. The sharp rise in disposable personal income (after taxes) since the low point of the 1957-58 recession is shown in Fig. 2. A further rise in disposable personal income will take place in 1960. The most important single component of this total (70.4 percent) is wage and salary income. A combination of higher wage rates — an increase of about 3 or 4 percent — and a greater volume of employment

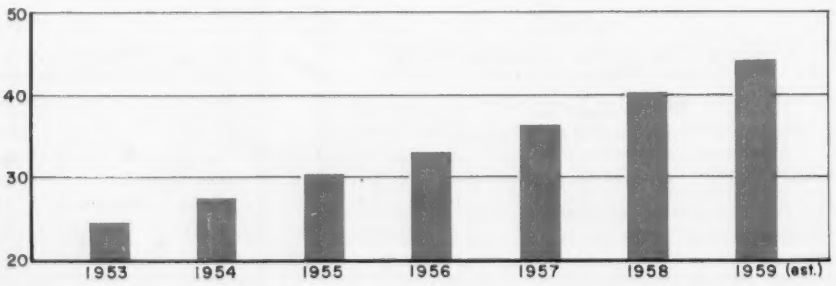


Fig. 1 — State and local government spending for goods and services in billions of dollars.

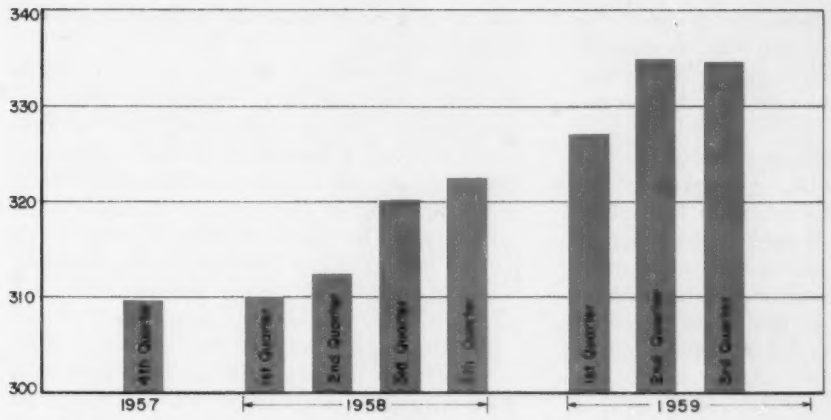


Fig. 2—Disposable personal income in billions of dollars, at seasonally adjusted annual rates.

will contribute to higher consumer incomes. A rise of $10 to $15 billion is probable.

As against this rise in labor income, the U.S. Department of Agriculture estimates there will be some decline in net farm income, possibly as much as $1 billion. The huge accumulation of surplus commodities as a result of our farm policies will put pressure on farm product prices. In the absence of a crop failure, increases in these prices do not seem probable. The result will be a decline in net receipts and net income of farmers.

Dividends Up

Improving profits have been accompanied by a rise of $1.0 billion in dividend payments. The outlook is for further dividend hikes in 1960. Higher interest rates resulted in an increase in personal interest income of $2.5 billion at annual rates between October 1958 and October 1959. Further increases in interest income will take place in the next year. Higher interest and dividend payments could result in an addition of $3 to $4 billion or more to consumer incomes.

On balance, therefore, consumer incomes should advance to new high levels. Since the most important single factor determining consumption spending is the level of incomes, this rise will lead to greater volume of personal consumption expenditures with the consequent increase in gross national product.

Automobile Industry

Automobile sales rose sharply in 1959 as the recovery proceeded. However, because of the adverse impact of the steel strike on production, automobile sales lagged in the last quarter. Inventories as of December 1 were significantly below normal levels. The automobile industry will step up activity in the early part of 1960 in an effort to overcome the output lost during the steel strike.

Ward's Automotive Agency estimated that the steel strike resulted in a production cut of 700,000 cars. It is important that the pipelines be filled before the spring selling season. Thus, it is probable that there will be a temporary overstimulus to the economy because of the increase in automobile production. This industry will provide an expanding force in the early part of the year but may have to be moved over to the negative side later in the year when production is cut below the high but unsustainable level of the catch-up period.

Neutral Force: Federal Spending

It is instructive to note that the economy recovered vigorously from the 1958 low point with only a small change in Federal government purchases of goods and services. By the third quarter of 1959 such spending had risen by $2.3 billion as compared with the increase of $44.1 billion in gross national product.

Expenditures by the Federal government should prove to be a neutral force in the coming year. As a result of the Eisenhower economy program, expenditures in the current fiscal year ending June 30th will be somewhat lower than during the preceding fiscal year. On the other hand, the marked recovery in business should yield an increase of $10 billion or more in government revenues. Largely as a result of this major increase in revenues, the deficit of $12½ billion in the 1959-60 budget will be almost, if not completely, wiped out. The revenues lost as a result of the steel strike may make it difficult to attain the goal of a balanced budget. Nevertheless, it appears that any budgetary deficit will be relatively small.

While projections for the fiscal year 1960-61 cannot be made with too much confidence at this writing, preliminary reports suggest a moderate increase in government spending, this rise probably to be offset by a further rise in government tax

receipts as recovery continues. On balance, the Federal government will take at least as much in taxes from the economy as it spends. It will neither contribute to nor retard the recovery which seems probable in 1960.

Because of the sharp business recovery, less emphasis will be given to public works projects. Reductions below the levels originally anticipated already have taken place in the highway program. Lagging tendencies will be experienced in other types of public works. Thus, although the Federal spending program should be neutral for the entire economy, it probably will be a negative factor for construction.

Negative Factors

The main negative factors in the outlook are the decline in residential housing, rising interest rates and tighter money, and the shift in our international balance of payments.

Residential Housing

Private nonfarm housing starts in 1959 totaled about 1.35 million, a rise of 18 percent over the 1958 level. However, in the last few months of 1959, starts were below the corresponding period of a year earlier. This decline has occurred as a result of a growing shortage of mortgage money as well as its higher cost. Sharply-rising interest rates on conventional mortgages have made FHA and VA mortgages less attractive to lenders, despite the rise to 5¼ percent on GI mortgages and 5¾ percent on FHA loans. These new rates are still below those obtainable on conventional mortgages. This tightness in the supply of mortgage money will continue to restrict starts in 1960.

There are several additional factors affecting the outlook for residential housing. The level of new family formation in the next few years will come close to its post-World War II low. This, in turn, will act in a broad manner to restrict the number of housing starts.

Residential construction costs in 1959 rose substantially more than in previous years. It is estimated that in 1959 new homes cost 4 percent more than a year ago in contrast to rises of 2 percent in 1957 and 1 percent in 1958. In addition, as a result of the high level of housing starts in recent years, vacancy ratios for rental dwellings have risen to a postwar high of almost 7 percent (for single family homes, the ratio is still only 1 percent). Thus, the pressures created by a tight supply have abated.

The Housing Act of 1959 may provide a slight stimulus to the industry. This law liberalized FHA down payments and provided some new funds for the agency. In addition, modest sums were allotted for slum clearance, college dormitories, housing for the aged, and public housing units. While this new legislation will offset slightly the negative factors on balance, nonfarm housing starts should be lower in 1960. A decline of about 10 percent from the 1959 level would not be surprising.

Higher Interest Rates

It is not generally realized that interest rates have been increasing irregularly since 1946 (see Fig. 3 for bond yields). During periods of recovery, such as 1948, 1953, 1957, and 1959, interest rates have increased to new high levels for the period. This has been followed by declines in periods of recession such as 1949, 1954, and 1958. It will be noted that each successive recession has recorded a higher level of interest rates.

During a period of recovery there is superimposed upon this longer-term increase in interest rates, from the abnormally low level of 1946, the effects of the large demand for funds at such times, and actions taken by the Federal Reserve authorities to dampen down a boom or inflation. Construction is especially sensitive to these short-term

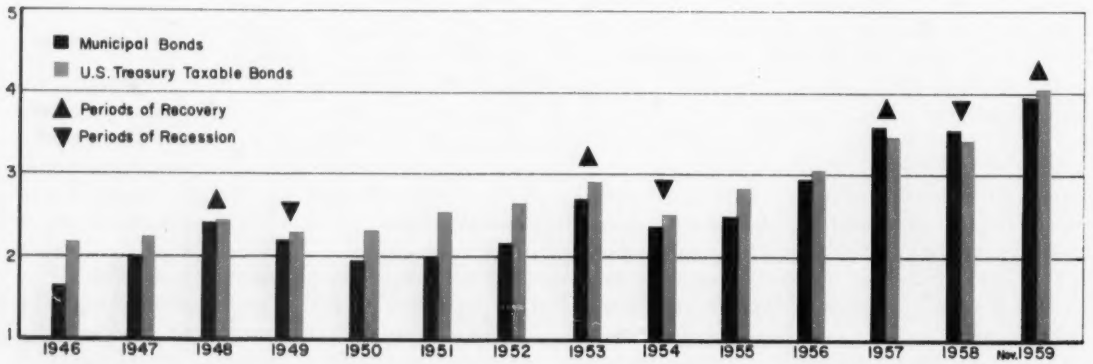


Fig. 3 — Municipal bond and U. S. Treasury taxable bond yields, in percent, by year from 1946 to 1959.

increases in interest rates because of its heavy dependence upon borrowed money. The impact of these forces was reflected in the increase of interest rates to 5¾ percent on FHA insured mortgages and the return of the 6 percent rate on conventional mortgages.

The demand for funds by state and local governments, consumers (installment buying), corporations (for new plant and equipment and inventory rebuilding), and construction will continue to be heavy in 1960. Under these conditions, interest rates will continue to remain high.

In addition, as recovery proceeds, the Federal Reserve authorities will not be willing to take steps to ease shortages of credit because of their justifiable fear that such actions would feed the potential fires of inflation. Therefore, tight credit and higher money rates remain negative factors.

Loss of Gold

Largely as a result of a decline in our exports and an increase in imports, the "dollar shortage" of the early postwar years has been converted into a "dollar surplus." From a net outflow of funds averaging $1.3 billion in the postwar years prior to 1958, the total increased to $3.4 billion in 1958 and an estimated $4.0 billion in 1959. One result has been a steady outflow of gold which has reduced our gold holdings from $22.9 billion at the end of 1957 to $19.6 billion currently and at the same time has resulted in a sharp increase in foreign balances held in this country.

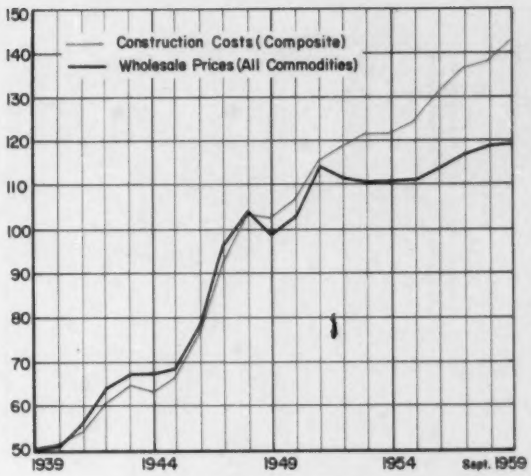
We have not yet reached a critical point. However, a continuation of recent trends could lead to a growing uncertainty about the actions taken to reverse the outflow of funds and the stability of the dollar.

The Outlook for Prices

During 1959, the general levels of wholesale prices and sensitive raw material prices have been fairly stable, the U. S. Department of Commerce construction cost index rose about 3 percent (see Fig. 4), and the consumer price index has risen about 1½ percent. Between October 1958 and October 1959, all groups of retail prices rose moderately, except food which declined about 1 percent.

The factors affecting the outlook for prices in 1960 are:

¶ Business activity will be expanding. The shortages attending the steel strike will create some pressures for higher prices, at least during the period when inventories are being rebuilt. However, capacity in most industries is more than ample to handle an increase in volume and thus, except for the temporary influences noted, should provide a barrier against significant price increases.



Source: U.S. Departments of Commerce and Labor

Fig. 4—Changes in construction costs & wholesale prices from 1939 to September 1959, based on 1947-1949=100.

¶ Labor costs will rise by 1 to 1½ percent more than output per manhour, thus creating some pressures for higher prices. This will be offset partly by the lower overhead costs per unit accompanying larger volume. The magnitude of the final settlement of the steel wage controversy will be important.

¶ The Federal budget will be close to in balance and hence should generate no inflationary pressure.

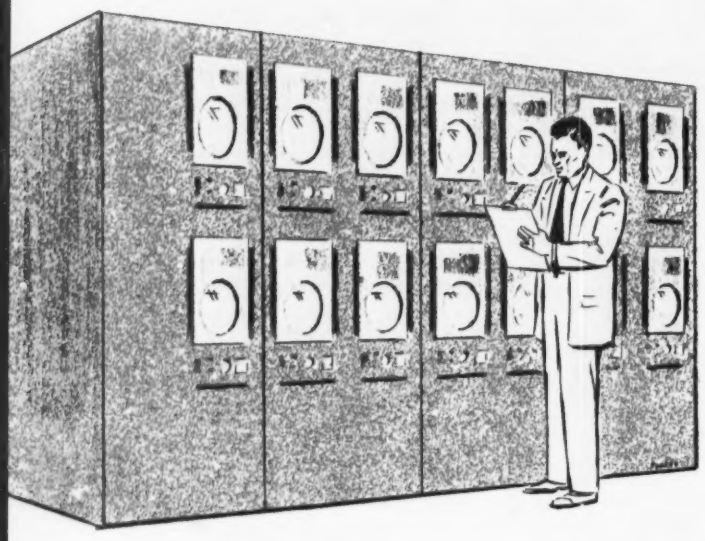
¶ Food prices are pointing downward as a result of record crops and large carryovers, but 1960 growing conditions will affect this pattern.

¶ Foreign competition has been growing in importance and should act to hold down prices of some products.

The net effect of these forces should be another year of moderate price change. A major inflationary price surge does not appear likely.

The Outlook

Business activity will move forward to new high levels in 1960 when the half-trillion dollar economy will become a reality. The aftermath of the steel strike will be an overstimulated economy to levels that cannot be sustained. Steel, automobiles, and other heavy goods industries will be producing at a rate that is high enough to meet actual consumption plus the rebuilding of depleted stocks. In the past such a frenetic pace of production has been followed by a downward readjustment in the affected industries. But a decline of this nature will be offset by the rising volume of new plant and equipment. Construction will share in this expansion of private industry. However, the outlook for public construction and residential housing is less favorable. ▲▲



Automatic Backwash

. . . for efficient operation at water filtration plants

KENNETH W. MALACH
Project Engineer – Mechanical
Whitman, Requardt and Associates

AS WATER PASSES DOWN through successive layers of sand and gravel in the filtering process, there is a gradual accumulation of solids which makes it necessary to clean, or backwash, the filter beds. In the rapid filter used in most plants, the necessity for backwashing occurs approximately once every two days, though this frequency will vary depending on the nature of the water being filtered and the rate of filtration.

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Sequence of Operations

The sequence of the operations in a conventional backwashing process proceed in this order. The valve on the filter influent is closed. After water in the filter bed drops to the desired level, the valve on the filter effluent is closed, and the drain valve is opened. Wash water pumps, if used in the system, are started. The wash water valve, which allows clean water to enter the filter, then is opened. Wash water flows through the filter sand and gravel in a reverse direction to that of normal filtering. The gravel and sand is gently lifted, or expanded, by the up-flowing wash water, causing the deposits of dirt to be floated up and carried into troughs leading to the drain outlet. The rate of flow of wash water is varied during the cycle, starting at a relatively low rate, increasing to a high rate, and then dropping off to a low rate again near the end of the cycle. After the washing has been accomplished, the influent, effluent, drain, and wash valves are repositioned in proper sequence to their normal positions for filtering operation. Additional steps, such as a surface wash, are used in many filtration plants.

While some plants use electric motors or diaphragm operators to open or close the filter valve, these valves in most plants are cylinder operated, and their position is controlled by four-way pilot valves in a hydraulic or pneumatic system. These pilot valves are grouped on a filter control table at each filter bed. It is obvious that during a manual backwash cycle, the operator's proper actuation of the four-way valves is essential in obtaining a correct sequence of valve operation, suitable duration, and proper rate of wash water flow. Since most water filtration plants have competent operators, and some safety interlocks may be included in a manual system, the desired results generally are obtained with this method.

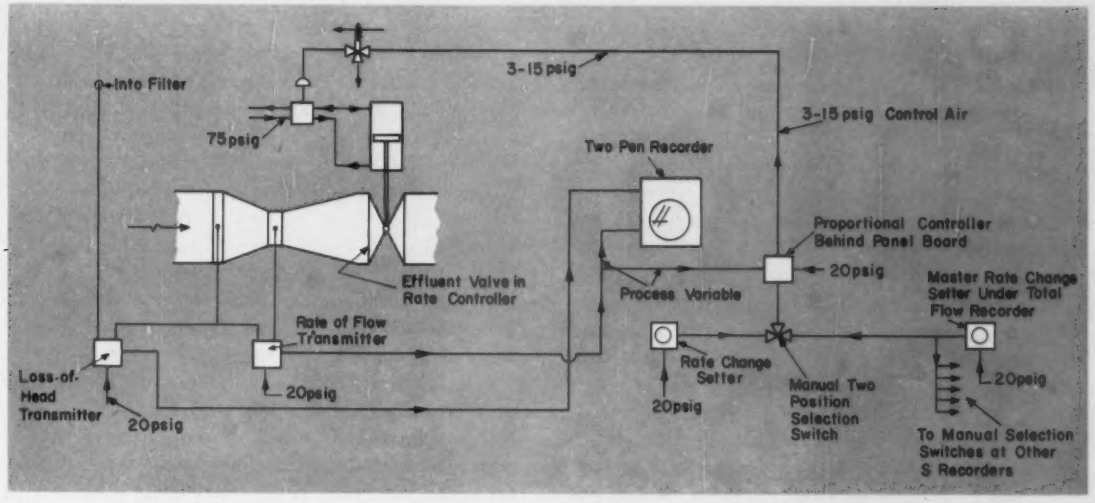
Automatic Backwash Cycle Control

It is apparent that the backwash cycle consists of simple functions which, except for changes dictated by seasonal or other conditions, are repeated for each operation. The cycle, therefore, lends itself to a pre-determined automatic programmed control. This has been recognized by filtration plant operators for some years, and many plants now use automatic cycling.

One of the early automatic backwash control systems was that of the Alexandria, Virginia, water treatment plant. It was applied to four filters and placed in operation in 1948. The system was expanded gradually and, by 1957, 14 filters were controlled automatically. Other examples of plants using automatic backwash control are:

¶ Morelia, Mexico – 6 filters in 1950.

¶ Citizens Water Company; Washington, Pennsylvania – 2 filters in 1953.



Typical control diagram showing loss-of-head and rate-of-flow transmitters and other accessory devices.

¶ U.S. Atomic Energy Commission; Hanford, Washington — 48 filters in 1954.
¶ Tonawanda, New York — 6 filters in 1954.
¶ Ardmore, Oklahoma — 6 filters in 1955.
¶ N.E. Filter Plant; Detroit, Michigan — 48 filters in 1956.
¶ Queen Lane Filter Plant; Philadelphia, Pennsylvania — 40 filters in 1956.
¶ U.S. Steel Company; Fairless Works, Pennsylvania — 4 filters in 1957.
¶ Rockville, Maryland — 4 filters in 1957.

The Potomac River Water Filtration Plant, now under construction, will incorporate automatic backwash control. Located on the Potomac River about 12 miles upstream from Washington, D.C., the plant will have six filters with a total capacity of 30 mgd, based on 3 gpm per square foot of filter area. Future stages of construction will result in an ultimate plant of 24 filters with a capacity of 120 mgd.

Experience at these plants, and many others, has resulted in an ever-growing interest in automatic backwash control. A number of consulting engineer firms are well qualified to design this type of system, and equipment manufacturers are producing the required components.

Automatic System Features

Automatic backwash control may differ somewhat from plant to plant in respect to the individual steps in the cycle and the physical location of the equipment. However, any system should include certain basic features to assure safe, dependable, and flexible operation.

¶ Cycle should progress step by step in a cascade manner, with each step being initiated by the actual main valve position of the preceding step. Generally, limit switches at the end position of valve travel are used to accomplish this. The tripping of each successive limit switch allows the next step to start, thereby assuring the proper progression of the cycle, with each step taking place only after the satisfactory completion of the previous step.

¶ Control devices should be selected as normally open or normally closed so as to "fail safe" with a loss of pneumatic pressure or electricity. The definition of "fail safe" may be altered to suit any particular job but generally means that the influent wash, surface wash, and drain valves will go to their normal filtering positions while the effluent valve goes to closed position.

¶ Re-set push button should be provided for each filter to give an operator the means of stopping a backwash cycle after the cycle has been started. Pressing of the re-set button automatically re-positions the various valves back to their normal filtering position in the same sequence that occurs during normal automatic operation of the cycle.

¶ Each filter's controls in a multiple filter installation should be interlocked so that after the automatic backwash cycle for any particular filter has been initiated, it is impossible to initiate the automatic cycle for any other filter until completion of the first. The complete cycle may include the settling time required between refilling and the return of the filter to the line, if that seems desirable to the designer.

¶ Provision should be made for the complete manual backwashing of each filter. This is done by including a 3-position (manual open, automatic, and manual close) selector switch in the control system

at each filter for each of the main filter valves. Also, if wash water is obtained by the starting of wash water pumps during the normal cycle, means for the manual starting and stopping of these pumps should be included.

¶ Arrangement of the control system should be such that after an automatic cycle has been initiated, the inadvertent placing of the selector switch for any particular valve to either "manual open" or "manual close" position, will not affect the proper continuation of the automatic backwash cycle.

¶ There should be means for manually extending the length of time of the high rate of backwash. During each cycle, a light should come on when the high rate of wash is at some pre-set, but adjustable, time from the end of its duration. The preset time is generally about 10 to 15 seconds. When the light comes on, the operator should be able to depress a hold button which will allow the high rate of backwash to continue as long as the button is depressed.

A Representative System

While any backwash system would have to make provision for the basic features described, an actual installation would involve much more. Assume, for example, a plant using wash water pumps. (For plants using elevated tanks for wash water this description still will apply except for those steps relating to the starting and stopping of wash water pumps.)

Wash water flow in this hypothetical plant is produced by a battery of three pumps, any two of which will produce maximum required flow, with the third being used as a standby. Manual preselection of two of the three pumps is made prior to the start of the automatic backwash cycle, and should be changed, probably once a month, to even the wear on the three pumps.

Wash water flow to any filter is controlled by a rate controller located on the main supplying the entire battery of filters. Recorder for wash water flow, means of changing the high and low rates of flow, and timers for controlling the duration of time of low, high, and low rates are all located on the central panelboard.

Control devices for the various main valves and water levels associated with a particular filter are arranged on a filter control panel located at each filter. Each filter control panel includes the start wash, the re-set, and the extend wash push buttons; warning light for approach of end of high rate of wash; 3-position (manual open, automatic, and manual close) selector switch for each of the five main filter valves; indicating lights for fully open and fully closed positions of each of the main filter valves; start-stop push buttons for the wash water pumps for manual operation of backwash cycle – complete with guards to prevent the inadvertent manual operation of the pumps; wash water rate of flow indicator; and a rate change setter for wash water flow.

Each filter control panel also includes air bubbler equipment; a pressure switch for sensing filter water level and actuating certain of the steps in the automatic cycle; and an adjustable timer for establishing the time delay, probably a couple of hours, required for the filter to settle after it has been re-filled and before bringing it back on the regular influent line.

Combination recorders for rate-of-flow and loss-of-head for each of the filters are located on a central panelboard. Two lights, one indicating excessive loss-of-head and the need to backwash and the other indicating that that particular filter is in the process of being backwashed, are located under each recorder. A rate change setter for remote control of the filter effluent rate and a set rate indicator also are located under each recorder.

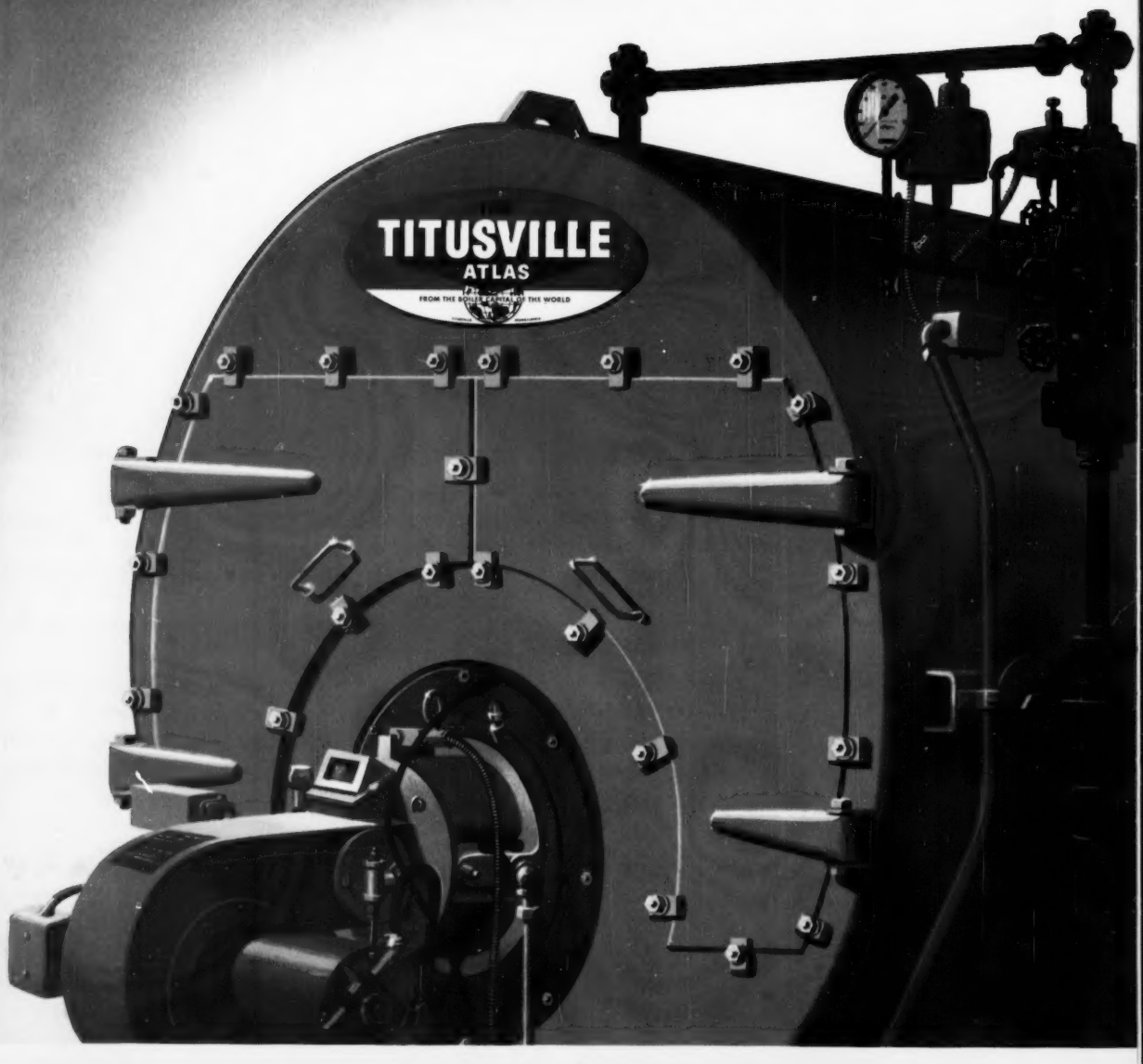
The main valves to be controlled at each filter are influent, effluent, drain, wash, and surface wash. They are pneumatic cylinder operated, using 75 psi air. Controls are a combination of pneumatic (the standard 3 to 15 psi) and electric. Valve positioning devices are pneumatic, while solenoids and limit switches are, of course, electric. During the operation of the system, limit switches on each main valve will cause either an "open" or "closed" indicating light to come on at the selector switches on the filter control panel when the valves reach their fully opened or fully closed position.

Why Automatic Backwash Control?

Since satisfactory results can be, and are, obtained with manually operated systems, an automatic system requires justification. Its most important contribution to better filter operation is uniform backwashing with each cycle. Different operators no longer need attempt to match each other's final washing results. With the adjustable features of the automatic system, the chief operator can set up the cycle to give the most desirable backwash results and be sure that these results will be obtained every time. Then, too, with manual operation, the danger always exists that an operator will open or close the wrong valve at the wrong time, with the undesirable result of dirty effluent water, flooded filter, wasted wash water, and improperly washed filters. The interlocked cascade progression of an automatic system makes it impossible to have incorrectly positioned valves. Finally, in an automatic cycle, it is unnecessary for an operator to remain at the filter for the entire cycle of operation. He can perform other duties in the plant. ▲▲

BONUS

from the Boiler



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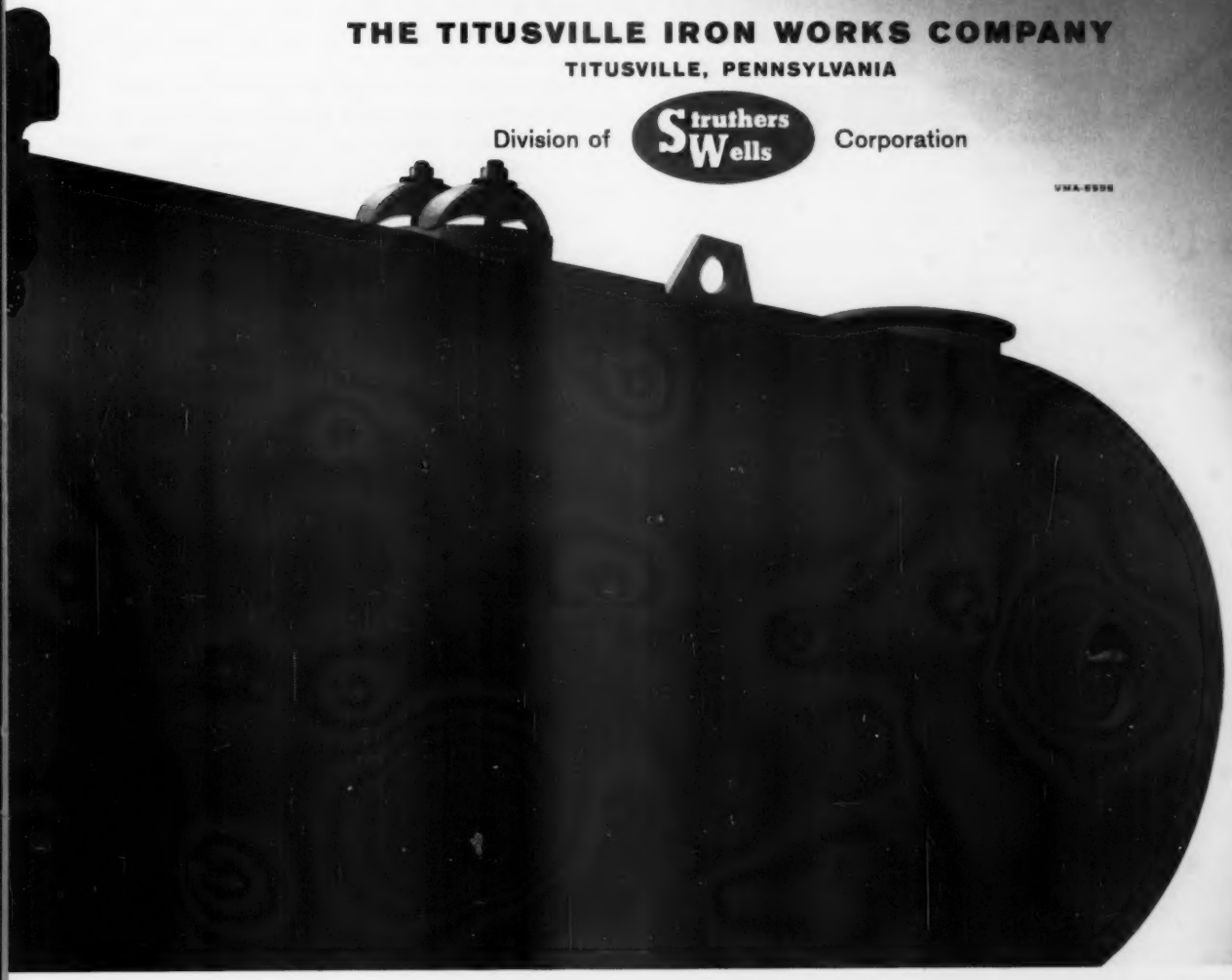

If architects did all
the kirks
And nothing else,

If engineers did all
the trains
And nothing else,

Harmony we'd have,

But nothing else!

Getting Along—

Suggesting an Appropriate

MAN'S UNENDING QUEST has resulted in the collection of an enormous and constantly-growing body of knowledge such that not even a Leonardo could begin to assimilate it. Because of this, men have been forced to seek knowledge through specialization. The result has been a stupendous advancement in learning, but at the cost of weakened communications between closely related groups. An analogy might be that of a number of men digging separate tunnels into a mountainside; if the mountain is Knowledge, the further each penetrates, the more remote he becomes from his fellows.

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Applying this analogy to the architect-consulting engineer relationship, there are many parallels. What is needed is a clearer understanding of who the architect and consulting engineer are, what they do, and how their relationship can be improved to their mutual benefit.

Since the two professions are much dependent on each other, I am convinced that a major step toward improved relations would be better understanding of each other. Toward this end, I would like to offer some observations about my profession.

The principles of good architecture today are essentially the same as they were in the days when the Greek and Roman civilizations flourished. Vitruvius left us an observation, which was paraphrased by Sir Henry Wotton, in 1600, and still has currency today: "Well building hath three conditions: commodity, firmness, and delight." Interpreting commodity as *function,* firmness as *structure,* and delight as *beauty,* these words still form the keystone of the creative architectural process.

Function is the social purpose of any building, including what is to be done in it, who is to do it, and how it is to be done. I suggest that there is no quarrel as to the preeminence of the architect in dealing with function, though he may call upon many engineers for specialized knowledge in the process of his studies.

Vitruvius next spoke of firmness, or structure — more precisely, good engineering. Since this is so obviously an area where disputes between engineers and architects will arise, skip over it for a

Professionally

Architect-Engineer Relationship

JOHN NOBLE RICHARDS

President, American Institute of Architects

moment and consider Vitruvius' third condition — beauty. Here is the area in which the architect feels most at home and where, because of the nature of the creative process, he is most frequently misunderstood. How does the architect see this creative process? First, architecture is an art form, like music, painting, and sculpture. Like the latter two, it is a visual art; unlike all three, it must be functional as well — it must shelter people, and serve as a primary aid to living.

Havelock Ellis, ordinarily an expert in quite another area, had this to say: "The art of building, or architecture, is the beginning of all the arts that lie outside the person . . ." Is this over-dramatization? I think not. Architecture is a matter of people, and it is the architect's job to adapt the art and science of building to human needs and wants.

This was not always so. Cheops did not give a fig for people when he erected the Great Pyramid, nor did Louis XIV with his incredible Versailles.

Today, however, buildings must functionally serve the people, processes, and events that take place within them. This human factor cannot be discounted, or reduced to formulae. If nothing more than shelter were necessary to satisfy man's wants, he should have been satisfied with the first cave he crawled into. The fact is, however, that man had no more than crawled into the cave than he promptly began decorating it with paintings.

Again, if man is to be contented with his environmental lot, why does he protest so much today against the unrelieved landscapes of smoke, telephone wires, and billboards? They may impede the function of the city, but the essential processes continue anyway.

The only possible conclusion is that man has an intuitive sense of beauty, whether it be in a flower, in a soaring tower of steel and glass, or in another human being. If this were not so, why in heaven's name would a grown man write a poem about a Grecian urn? More to the point, why would anyone want to read it?

Beauty is something integral to every society, though the level of taste is conditioned by the degree of education and amount of leisure time available. In early America, as in any pioneer society, the first order of business was survival. Still later, with the growth of the country, an indigenous culture appeared, and it is from this that the culture of our own time has sprung.

Although the history of architecture shows various periods in which no advancements in technology or styles were made, today's architecture can only be described as vibrant and alive. Gone are the borrowings from Gothic, Renaissance, Baroque, or Georgian, as if they were so many icings on the cake. We already have seen the development of the spare, angular, thrusting architecture that characterizes our skylines today, and behind it are still newer developments that take advantage of man's advanced technological development, and the availability of new materials and forms.

My brief, then, is that the architect is a very real factor in our culture, and his eminence in today's world carries with it very real responsibilities. No one else can do his job for him.

Note that it is possible to repeat those same words, substituting engineer for architect. The engineer's role in the transformation of our society is no less important, but it is essentially different.

The architect does not for a moment contend that the engineer is without a creative spark. I know an engineer whose supreme moment was the creation of one of today's great bridges. That was many years ago. Even today, the story goes, he returns frequently to regard his work, and never fails to weep at the beauty of it. This is a feeling the architect understands.

The Area of Misunderstanding

Returning now to Vitruvius' second condition, good engineering, we enter the prime area of misunderstanding between our two groups. Some of the problems that arise are easily solved; others would try the wisdom of a Solomon.

Consulting engineers are engineers who are independent practitioners. They most often work on a fee basis, and when the work has to do with buildings, they usually are selected by and work

under the direction of architects. Some engineers say that this is being relegated to inferior status by the architect. The architect does not understand this attitude at all.

If I could suggest an analogy, the modern airliner usually has a complement of three or four highly skilled men in the cockpit on every flight, each man performing a series of demanding duties that blend into an extremely efficient performance. But if each man in the cockpit were to try to do the other man's job, the result would be chaos.

Similarly, the architect who thinks he is an engineer, or the engineer who thinks he is an architect, and holds himself forth as such, is doing a disservice to his profession and the community at large. When this sort of wrangling develops, it creates a condition that is perfect for the package dealer – who might be called the threatening autopilot of our analogy.

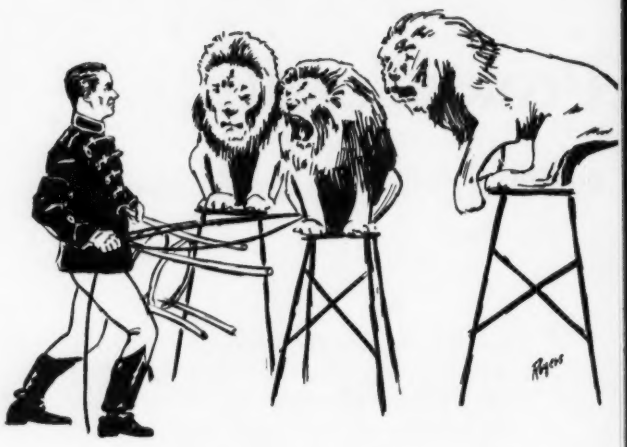
Coordinating the Work

Who should serve as the coordinator of a building project? Custom dictates that it should be the architect for architectural projects and the engineer for engineering projects. So far, so good, but now come the problems. Engineers look upon power plants, warehouses, and factories as engineering projects. It is the contention of some that, once the mechanical and electrical equipment is in place and the structural frame is worked out – which is the engineer's job – wrapping it in a masonry exterior is something that any fool could do.

But someone must coordinate building projects, and the architect argues that he should assume this responsibility. If the engineer is fit to assume these duties, then he is an architect. Some engineers, in turn, frequently advance the argument that, on some projects, the engineering services represent up to 50 or 60 percent of the total construction cost. And since this is true, responsibility (and fees) should be recast with this in mind. But on any modern building project, there is not just one, all-knowing engineer – there are many. There are civil, structural, mechanical, electrical, and chemical engineers – and frequently others. The work of all these, the architect, rather than some one engineer, should coordinate.

It is not the contention of the architect that the engineers' jobs can be done away with. Far from it. It is, however, his argument that someone must collate the information of a great many engineers, together with the work of many other experts and technicians, and create out of these a coherent, functional structure that is also esthetically pleasing.

There is, we can agree, a greater tendency among engineers to concentrate upon a narrow field. And while it is necessary for an architect to understand



some engineering, the engineer does not necessarily have to understand any architecture.

There is no gainsaying the fact that most architects could not design an intricate structure without the services of the engineer. Yet, to use another comparison, consider what must be the relationship between a surgeon, whose skills are applied to all parts of the body, and the orthopedist, whose frame of reference is more limited – but whose knowledge of that specific area is comprehensive. It would be unthinkable for the surgeon to attempt to diagnose an orthopedic ailment, and it would be equally unthinkable for the orthopedist to attempt to assume the broad responsibilities of the surgeon. Each man must, and does, respect the other's talents and special training.

Other areas of difference doubtless will continue to exist, but these are greatly in the minority. Engineers feel, frequently with good reason, that architects fail to give them proper recognition. Engineers also have heard from time to time of architectural firms with full staffs of engineers undertaking engineering projects. I think we are agreed that the shoemaker should stick to his last, and the only ethical solution to a problem such as this is for such a firm to have an engineer as one of the principals and operate as an architect-engineer.

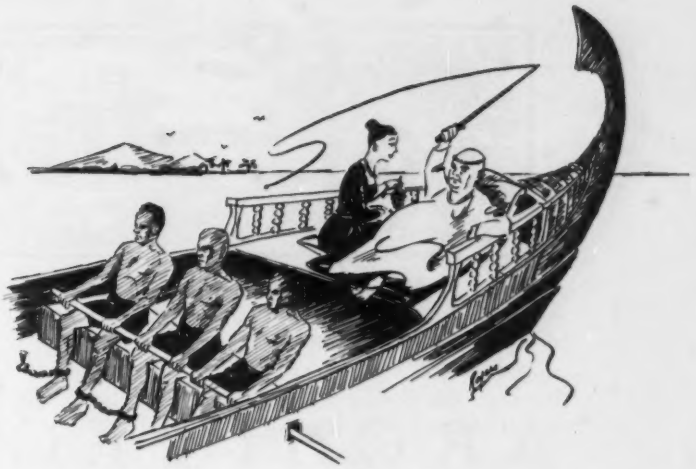
On the other hand, architects find that some engineers still insist with a fingersnap that they can "do" architecture.

Packaged Competition

Instead of this sort of sniping, it would be far more desirable to have the two professions close ranks against the nonprofessional building service offered by the package merchant who purports to offer both design and building services in one contract and would supplant the art and science of building with propaganda and cut-rate designs.

THE ARCHITECT AS A COORDINATOR . . .

as he sees himself



THE ARCHITECT AS A COORDINATOR . . .

as the engineer sees him

A common lure is the guaranteed-price package contract. But no human being can look into the future and accurately guess at the exact future cost of materials and services. Thus, the only way in which a contract of that type can be offered is either to pad the price or to leave the specifications purposely vague to permit skimping. This practice destroys the economic advantages of competitive bidding by contractors, and it fails to provide professional supervision during construction. The packager supervises his own work. The end result is that the uninformed public all too often equates the package dealer and his all-too-frequent shoddy work with that produced by independent practitioners. Thus, the stature of both architects and consulting engineers is eroded by those who regard professional competence as a commodity they can buy and sell, and who regard professional registration laws as something to be flouted.

The truth is that the back-room designer, although holding himself out as a purveyor of a sort of supermarket full of engineering and architectural services, does not have the courage to accept personal responsibility for the architectural and engineering decisions that flow out of his wheezing "think" machine.

Working Together

Despite all our arguments, the present relations between the architectural and engineering communities are generally very good, and steadily improving. Currently, the AIA is working very closely with the Engineers Joint Council, and we have an excellent joint committee. The objectives of this joint committee are: "To maintain and further develop proper relations between engineers and architects. To cooperate on problems of national scope which are of interest to The American Institute of Architects and the Engineers Joint Council as well as other groups, in areas such as design, site planning, construction, and matters of mutual interest."

We hope that some of the fruits of our labors soon will be evident to architects and consulting engineers, both as groups and as individual practitioners. We hope too that both professions will foster the growth of understanding.

On the personal level, architects should admit their limitations, particularly in the areas of engineering and science. It is a frequent complaint of engineers, undoubtedly grounded in fact, that some architects are know-it-alls who kid the client into thinking of them as modern-day Leonardos, while the poor engineer labors unwittingly behind the scenes to support the deception.

But the engineer, for his part, must recognize his limitations, particularly in the areas of function and beauty. He should accept the architect as the coordinator on architectural projects, the man normally responsible for the engineer's work. We will, no doubt, long argue about which projects are architectural and which are engineering. It is easy to assign the home, the church or the school to the architect and the dam or the highway to the engineer. It is the great middle ground on which we sometimes disagree.

Meanwhile it is estimated that some $600 billion worth of new construction will be undertaken in America in the next decade – more than the worth of all existing buildings in the country. This job must be done by the engineers and architects working as a team; there is simply no one else to do it. That is why our two professions must continue to bend every effort, both on the national and local levels, to promote good practice through strong registration laws, logical local building codes, and sensible regulations. With continued competence in our separate fields, we must strive to work together in harmony and with mutual respect. ▲▲

THE ARCHITECTURE OF *Leone Batiſta Alberti.*

JAMES KIP FINCH

ALTHOUGH the Goths and the Vandals sacked Rome in the 5th Century, the chain of continuity with the past was never as fully broken in Italy as in France. The French Renaissance took place in the 12th century, while Italy waited and made her advances in the 14th, 15th, and 16th, designated by Italians as the Tre, Quatro, and Cinquecento.

Although lacking any unity as a state, Italy remained more or less isolated from the turmoil that disrupted the West during this period. The Holy Roman Empire, which had attempted to unite Roman and German interests, had, as Voltaire remarked, ceased to be either holy, Roman, or an empire. The city-states of Northern Italy were divided by the ambitions of rival political factions, and to the south, the Kingdom of Naples was a disputed area. It was in this politically fragmented climate, free of foreign entanglement, that the rivalry between cities and their princes generated the forces that brought on the Italian Renaissance.

It was a period of sharp contrasts, a blending of new interests with the ancient ideas stemming from a rediscovery of the past. Exploration discovered the New World. Natural science at last began to free itself from the inhibitions of Greek philosophy and the restrictions of the Church. Men began to accept new ideas of the universe and man's position in it, ideas that conflicted with long cherished beliefs. On the other hand, ancient ruins revealed the greatness of the past and led to a conviction of Roman superiority. It was in this atmosphere of contrast that another chapter in the evolution of the engineering profession was written.

This was the era of Leone Batista Alberti. He was born in Genoa in 1404, the illegitimate but accepted son of a noble and once wealthy family. He studied law and natural science, traveled widely as secretary to a cardinal, and became interested in painting and sculpture. Later he combined his work as an architect in Florence with an active career as a writer of poetry, plays, and essays.

Alberti's greatest work was *De re aedificatoria.* Written about 1452, it was not published until 1485, 13 years after his death. There is, even now, no direct translation of this work from Latin to English. It was first translated into the Italian by Pietro Lauro, in 1546, and again by Cosimo Bartoli, in Florence, in 1550, and published as an illustrated edition. This edition was translated into English and published, with new illustrations, in 1726, by Giacomo Leoni, a Venetian architect who had come to England 10 or 15 years earlier. The third edition of that translation (1755) now has been edited and annotated by Joseph Rykwert and reprinted by Alex Tiranti Ltd., in London, 1955. The text of this new edition is plated from an 18th century copy, with the long "s" and capitalized nouns.

Image of Alberti is presented by Florence to Britannia. Seated figures represent Art and Architecture. Frontispiece from Leoni's first edition dated 1726.

A quick reading of Alberti *On Edifices* gives the impression that the medieval craftsman had vanished overnight and that the Renaissance architect had returned suddenly to the professional standards and status of the Roman architectus of Vitruvius' day. Indeed, Alberti's work at first sight seems to be but a new and somewhat revised edition of *De architectura*. Alberti does owe a debt to his great predecessor, but he does not hesitate to criticize him for his lack of clarity and for his heavy reliance on Greek sources. Alberti says, "His style is absolutely void of all ornament, and he wrote in such a manner that to the Latins he seems to write Greek, and to the Greeks, Latin . . ."

A Bible for the Renaissance Architect

On Edifices became the bible of Renaissance architects. While it inspired them to emulate the past, it also furthered a contemporary development because of its overwhelming artistic interests. Architectural design had long required an understanding of both planning and the means of executing plans; of the methods, resources, and limitations imposed by available materials and the tools, equipment, and skills of the manual worker. Thus, it was the separation of design effort from the labors of the humble workman, "the instrument to the architect" as Alberti called him, which apparently brought about the recognition of architecture as a fine art. It was a movement whose beginnings are reflected clearly by Alberti and which was to have a profound influence on the later evolution of architecture and engineering. Thus Alberti writes, "It is generaliy allowed that the pleasure and delight which we feel on the view of any building arises from nothing else but beauty and ornament . . . I therefore began to examine what beauty really was and what sort . . . was proper to each edifice."

In his preface he likewise explains, "Before I proceed further, it will not be improper to explain what he is that I allow to be an architect: for it is not a carpenter or a joiner that I thus rank with the greatest masters in other sciences; the manual operator being no more than an instrument to the architect. Him I call an architect, who, by a sure and wonderful art and method, is able, both with thought and invention, to devise, and, with execution, to complete all those works, which, by means of the movement of great weights, and the conjunction and massment of bodies, can, with the greatest beauty, be adapted to the uses of mankind."

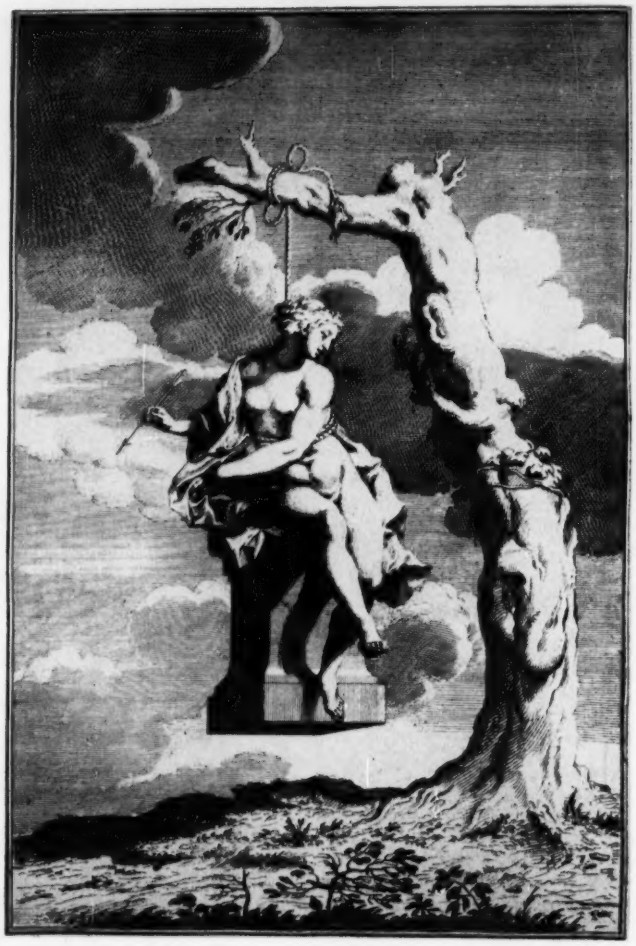
Men had been erecting buildings for centuries. Erection techniques and construction standards were well known, relatively simple, and largely standardized. In the construction of buildings a more or less complete separation of the planning and design phase from the technical and manual operations of building was possible. The architect could provide simple sketches and leave to the *capomastro*, or construction superintendent, the execution of the work. One does not wonder, therefore, that Alberti continues thus, "The thing of greatest consequence is to choose skillful workmen, not light or inconstant, whom you may trust with the care and management of an edifice . . ."

Building architecture was, thus, loosened from its ancient ties to the practical arts. The typical Renaissance building expert usually began his career as an artist in the studio of a painter, sculptor, or goldsmith. He went on to design buildings and, as opportunity offered, engineering work. He was an artist-architect-engineer, but first an artist.

This divorce of design from manual operations and techniques may have been basic to the achievement of professional status by the architect. It has been argued that the development of the architect's freedom and social stature was more important than the establishment of standards of workmanship. But it is also true that the evolution of the engineering aspects of the profession was retarded by this emphasis on art. The aesthetic approach left little time for the new military engineering of gunpowder and cannon or the development of new machines for use in the building of canals.

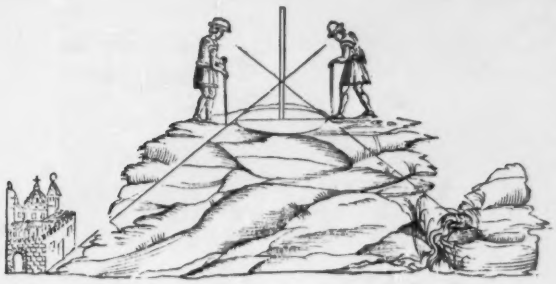
There was, however, no immediate break in the ranks of the profession. Alberti found it possible

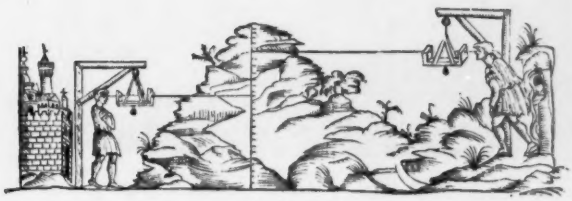
Illustrations are taken from the first (1726) edition of Leoni's English translation. They were engraved by a French artist, Bernard Picart (1673-1733) from Leoni's drawings, which in their turn, were based on the woodcuts in the Bartoli edition of 1550, published in Italian. The two simple line drawings are reproductions of the Italian woodcuts. They were combined in the engraving at their right.



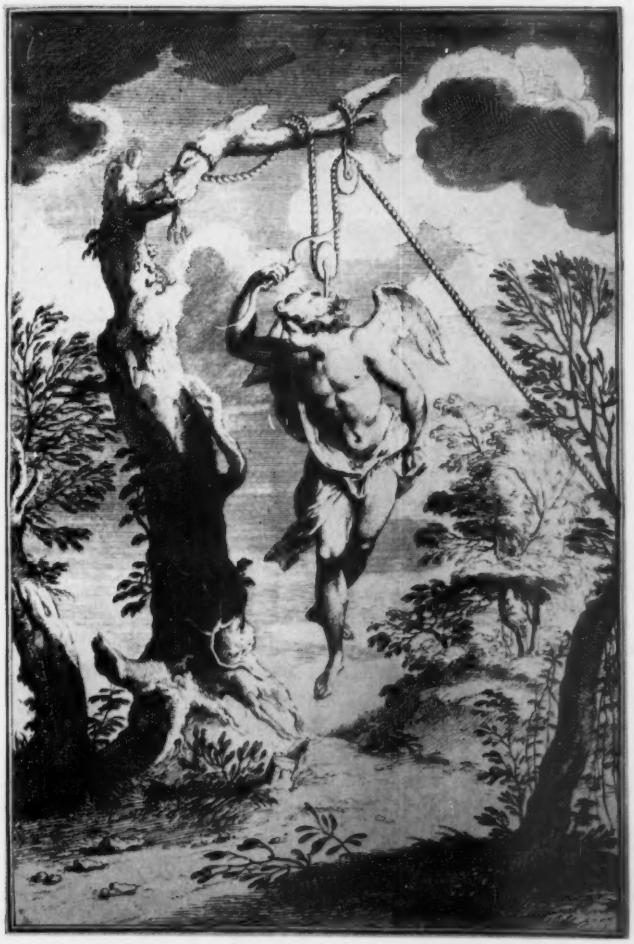
"But that you may understand the reason of the thing more clearly, take a statue of a thousand weight; if you hang this to the trunk of a tree by one single rope, it is evident this rope must bear the whole thousand weight." — Book VI, Chapter VII.

"In the morning extremely early, when the air is perfectly clear and serene, lay yourself flat with your chin resting upon the ground: Then take a careful survey of the country all around you, and wherever you see a vapor rising out of the earth, and curling into the air like a man's breath in a clear frost, there you may be pretty certain of finding water."—Book X, Chapter IV.





"We find these heights by taking different steps of measurement. I call them steps because they are like those steps by which we ascend to a temple. One line of these steps is the ray of sight which goes from the beholder's eye along the same level with his eye; which is made by the square, the level and the plumb line; and the other line is that which falls from the beholder's eye down to his feet in a perpendicular . . . The other method, is by drawing one line from the sluice to the top of the hill which interferes, and another line from thence to the head, and by computing the proportions of their angles, according to the rules of geometry." — *Book X, Chapter VII.*



"Fasten a pulley to the statute, and into this pulley let the rope by which the statue hangs, and bring this rope again to the trunk of the tree, so as the statue may hang upon the double rope, it is plain the weight of the statue is then divided between two ropes, and that the pulley in the middle divides the weight equally between them. Let us go yet further, and to the trunk of the tree fasten another pulley and bring the rope up through this likewise." — *Book VI, Chapter VII.*

to reconcile these diverging interests. He points out that the provision of safe and pleasant shelter is not the only debt owed to "the art and skill of the architect" under whose direction also "mountains are bored through, valleys filled up, lakes confined, marshes discharged into the sea, ships built rivers turned, their mouths cleared, bridges laid over them, and harbors formed . . . Add to these the engines and machines of war, fortresses, and like inventions . . . Let this suffice," he concludes.

But later Renaissance architect authors gave decreasing space to engineering interests. What we now know as civil engineering still remained attached to architecture, but it had to be resurrected in 17th and 18th century France. It was not until 1715 that the first book devoted solely to bridges appeared. The first book on military engineering was printed in the year Alberti died, 1472, and other books on engineering were to follow.

As a result of the Renaissance architect's emphasis on art and ancient Roman techniques, he was led to concentrate on the design of buildings and to neglect or ignore advances in materials and technical understandings which were to create a new engineering era. In a more modern age of iron and steel, the architect continued to live in a past of wood and stone. Following an eclectic approach, later architects also long continued to turn to past styles for the often incongruous clothing with which to cover contemporary needs and new constructions. It may well be asked whether this break in interests, which Alberti furthered, did not retard rather than encourage both architecture and engineering.

A History of Renaissance Engineering

Judging from the table of contents of Alberti's *De re aedificatoria* one would expect it to be devoted almost entirely to buildings and ornamentation, with little of engineering interest. There is no doubt that his major concern was in the design of beautiful buildings, but his book includes important chapters on bridges and highways, objects that escaped Vitruvius' attention. He avoids most of the childish explanations of technical problems which Vitruvius offered and, as in his works on painting and sculpture, writes far more clearly than the old Roman. His book reveals understandings that were ultimately to lead to the birth of engineering science and a more rational procedure of structural analysis and design. Thus, in an interesting chapter on beams and rafters, he shrewdly observes, "Beams ought to be perfectly sound and clear, and especially about the middle of its length it ought to be free from the least defect . . . beams that have knots are to be absolutely rejected . . ."

However, his chief engineering interest centers on the major structural innovations of his day.

A timber bridge based on Caesar's design. Actually, only one brace was used to hold cross members in. Illustration from Leoni's first edition dated 1726.

These advances — the dome, the segmental arch, and the canal lock — are of particular interest. Alberti offers some interesting suggestions on the location of bridges, advising not only that they be convenient to the needs of the cities where they are built but that the preferred site should be on a straight reach of the stream to insure strong banks and to avoid eddies and the floating debris that is apt to accumulate in bends and elbows. In addition, "An odd number of arches is both most pleasant to the sight, and conduces also to strength, for the farther the current of the river lies from the shore, the freer it is from impediment and the freer it is the swifter and easier it flows away . . ."

He dismisses timber bridges with the statement, "We cannot give a better example of this sort of bridges than that built by Julius Caesar." He describes it as a pile bridge with sloping pile fenders to "receive and intercept the violence" of any floating debris. Turning to stone arches he insists on sound stone work and no "stuffing" such as may be used in filling the haunches of vaults. His precise specifications include, "Let the thickness of the pier be one fourth of the height of the bridge . . . whatever sort of arch you vault your bridge with, it must be built of the hardest and largest stones, such as you use in your piers; and there should not be a single stone in the arch but what is in thickness at least one-tenth part of the chord of that arch; nor should the chord itself be longer than six times the thickness of the pier, nor shorter than four times." He further advises "make the pier in the form of a ship with one angle at the stern and another in the head," prefers a pointed cut-water,

not too sharp, to a circular form, and warns that "Water is much more dangerous to the stern than to the head."

On foundations Alberti evidently felt that experience was the best teacher. "It is my opinion that the best way is to take counsel with discreet and experienced men of the country and with neighboring architects, who, both from the example of old structures and from their daily practice in actual building, must be the best judges of the nature of the soil, and what weight it is able to bear." He also describes in further detail the cofferdam technique for founding bridge piers.

The Invention of Canal Locks

Book (Chapter) X, in which Alberti deals with water, repeats in many respects the suggestions and observations of Vitruvius but it also includes the first description of the most important contribution of the Renaissance – perhaps the outstanding hydraulic invention of all time – the canel lock. Canals had been used for transportation for centuries, but the shallow water resulting from excessive river slopes was simply held back to provide a navigable depth of channel by means of clumsy stop-log or similar single barriers. These were laboriously removed when boats were passing up or down, and the vessel pulled through with ropes or allowed to shoot the rapids.

Today the idea of using two gates to form a lock-chamber and avoiding the clumsy, laborious and dangerous task of pulling boats through against the current seems obvious, but it was Alberti who provided the first adequate description of the canal lock. "The locks in a river are made either by sluices or floodgates . . . To each lock you ought to make two stops, cutting the river in two places, and leaving a space between them equal to the length of a vessel, to the intent, that if the vessel is to ascend, when it comes to the stop the lower sluice may be shut and the upper one opened; or if it be to descend, the upper one may be shut and the lower opened . . ."

By Alberti's time, the horizontal gate had replaced the vertical or sluice type, and another basic lock device, the wicket gate to relieve the pressure on and ease the opening of the main gate, had been devised. "We may draw up the heavier sluice without danger to our men, by applying to the spindle or windless which is to draw up the sluice wheels notched with teeth like the wheels in a clock. . . . But the most convenient of all is the floodgate, which in the middle has a spindle that turns upon a perpendicular axis; to this spindle is fastened a broad square valve, like the square sail of a barge which may be easily turned about . . . but the two sides of this valve shall not be exactly equal to one another in breadth, but let one be above three inches narrower than the other; by which means it may be opened by a child . . ."

Alberti also has some suggestions to offer on roads and highways. He discusses the "High Streets" of a city or town both from the standpoint of offering the best setting for buildings and in the interest of defense. His ideas on country roads reveal, however, the hazards of travel in his day. "The ways are not to be made in the same manner in the country that they are in the city . . . if the city is noble and powerful, the streets should be straight and broad . . . in the country they ought to be spacious and open, so as a man may see all about him . . . without lurking places for rogues to hide themselves in . . . I do not reckon the shortest way to be always that which is straightest but that which is the safest."

Thus, Alberti covers in a most interesting and revealing way the major trends and developments of this exciting age of change and adjustment. He is of special interest to the modern architect and civil engineer. However, one must look elsewhere for a record of the new military interests which also were leading rapidly to the separation of engineering and architecture. The growing use of machines and water and wind mills is recorded in other great books of the period as is the revival of mining, which was under way at the time. Yet, one cannot fail to appreciate Alberti for completing, in spite of many cares, labors, and discouragements, this great book of architecture and engineering. That he was a man of many outstanding attributes is clear from his statement, "As to other virtues, humanity, benevolence, modesty, probity: I do not require them more in the architect, than I do in every other man . . . For indeed without them I do not think any one worthy to be deemed a man." ▲▲

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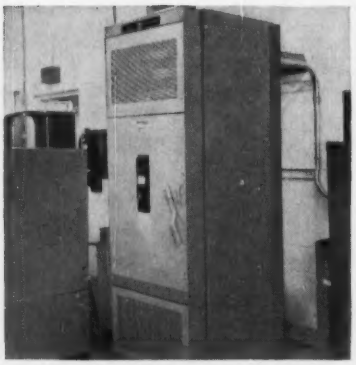

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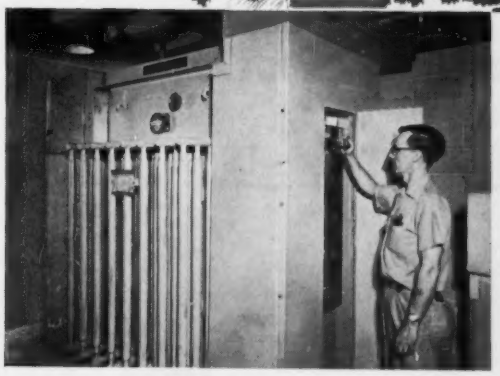

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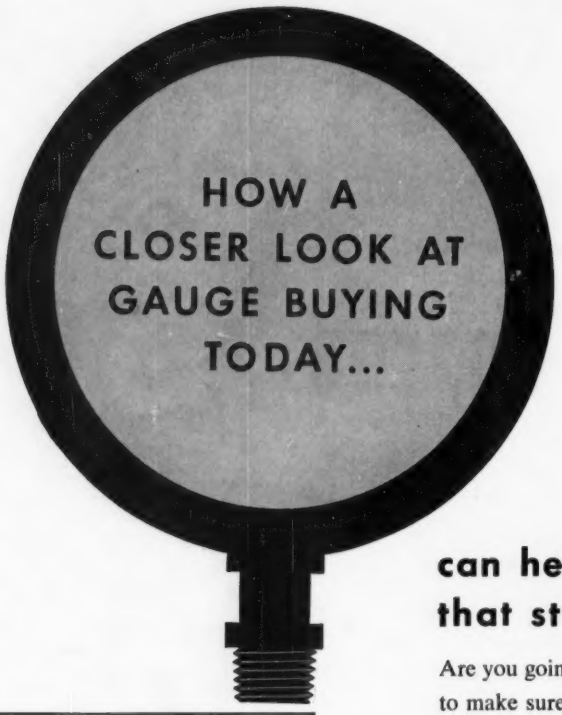

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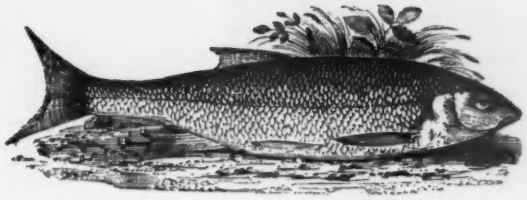

. . . Lunch with the directors of the Consulting Engineers of Ireland

MARJORIE ODEN, Eastern Editor

WHEN WE VISITED the Irish engineers a few months ago, their association was a "member-in-waiting" of the International Federation of Consulting Engineers. The Irish attended the last FIDIC meeting, in The Hague, in May, as observers, then applied for membership. FIDIC held an executive meeting late last month, so Ireland is now the newest member of that international group.

Although the Association of Consulting Engineers of Ireland was formed in 1938, there was little activity until recently, but today, the Irish Association includes representatives of 26 of Ireland's 32 counties and has a membership of 30 consultants. Its full program resembles that of one of the more active state or regional associations in the U.S.

Hospitality Excellent

Our visit to Ireland was one of the highlights of a European editorial tour, and Ireland is given top recommendations as the perfect first stop for a consulting engineer on his way to Europe, though it helps, we must admit, to be traveling with a Faherty, of County Galway — Joan Faherty, executive secretary of the New York Association of Consulting Engineers.

We were met at the train station by Eoin Kenny, who heads one of Ireland's older consulting firms, J. A. Kenny & Partners, of Dublin, and long a faithful reader of this magazine.

With little warning of our impending visit, Kenny had arranged a luncheon so that we could meet the Association's executive committee. The food in Dublin was a pleasant surprise — fresh salmon, followed by a savory and Irish coffee. After lunch, the group adjourned to the home of P. J. McCarthy, Association president, for an open discussion of the organization's problems and accomplishments.

First among their problems is competition. These Irish engineers complain that the government is doing its own engineering work, contractors willingly supply plans for projects, and free engineering by manufacturers is rampant.

The Turf Board (this group controls peat mining, not pari-mutuel policies) conducts its own research program. The Electricity Supply Board does all its own design for power plants and controls distribution and all matters relating to electricity in the country. Both the Turf Board and Electricity Supply Board give considerable employment to engineers — but not consulting engineers.

The Office of Public Works, a branch of the Department of Finance, designs all schools, state buildings, and arterial drainage projects.

Local authorities design and execute the construction of their own road projects.

Consulting engineers are, in many areas, engaged to design and supervise water and sewage installations, but some local authorities even carry out water and sewage schemes with their own staffs.

"Our biggest problem is the inclination of public authorities to do all engineering design themselves," the consultants agreed.

Political Complications

As in the United States, the Irish consultants feel that the only way to combat this tendency is to show that it is less costly to engage a consultant to design and supervise than to use government employees, but accurate figures are hard to come by. And the consultants have another complaint. "On most of Ireland's public projects, a nontechnical man has the final say. On local projects, a manager who is retained by the local council exercises statuatory control over the engineers."

Unlike the situation in the United States, public engineering jobs pay better for a young Irish engineer than does working in the office of a consultant. Yet, traditionally, consulting engineers have taken the young men from school and given them several years of valuable training before they go

out on their own or into other fields of employment. This has served as a sort of internship, but, "If government engineering continues to expand, we will not be able to train these young men," the consultants agreed.

Package Deals

Package deals are an increasing source of worry to Irish consultants, just as to consultants in other countries. They agree that it is a matter of salesmanship, or education. The clients, public and private, must be made to realize that it is more satisfactory and costs less to engage an independent consultant than it is to do without one.

In Ireland, most clients, through long years of habit, go first to an architect when an industrial plant is to be built. This puts the architect in a position of control even on industrial projects, and all too often the architects fail to select a consultant until late in the planning stage. And, as in other parts of the world, there are some architects who engage engineers only as a last resort, preferring to get what help they can in technical matters from manufacturers.

Architects have complained of consulting engineers doing the same thing – doing architecture in their own offices without the help of an architect. The Association has formed a joint committee with the Royal Institute of Architects and hopes to solve some of these problems.

A further difficulty under study is the preparation of designs directly for contractors. The problem is to determine responsibility. "This presents quite an ethical problem," McCarthy commented. "Who is responsible for the public safety on these projects – the engineer who does the anonymous design or the contractor, who did all the work so far as the public knows?

The Association is working to see what can be done about this, but they feel somewhat handicapped in that Ireland has no registration system.

Few Outside Consultants

Not many consulting engineers from England, the U.S., or other countries go to Ireland to take work away from the local engineers. "We do not have this problem. There is not enough capital investment to attract them, so coming to Ireland is considered rather unprofitable. In some instances specialists are called in, but no objection can be taken to this. On the other hand, there is one aspect of foreign competition we particularly do not like – the foreign supplier who offers 'free engineering.'"

The Irish do not regard teachers who do engineering work in their spare time as unfair competition. "After all, the consulting engineering profession in this country was founded by professors.

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We could not very well complain about them now," one engineer pointed out. Professors who do part-time consulting work also are allowed membership in the Association in certain instances.

Why did the Irish consultants request FIDIC membership, we asked the Executive Committee. "Our thoughts are going along international lines," McCarthy explained. "Currently, none of our members have foreign projects. But we could handle work in other nations through joint ventures among our members. Also, we feel we can profit by the experiences of engineers in neighboring nations — and perhaps contribute something of our own."

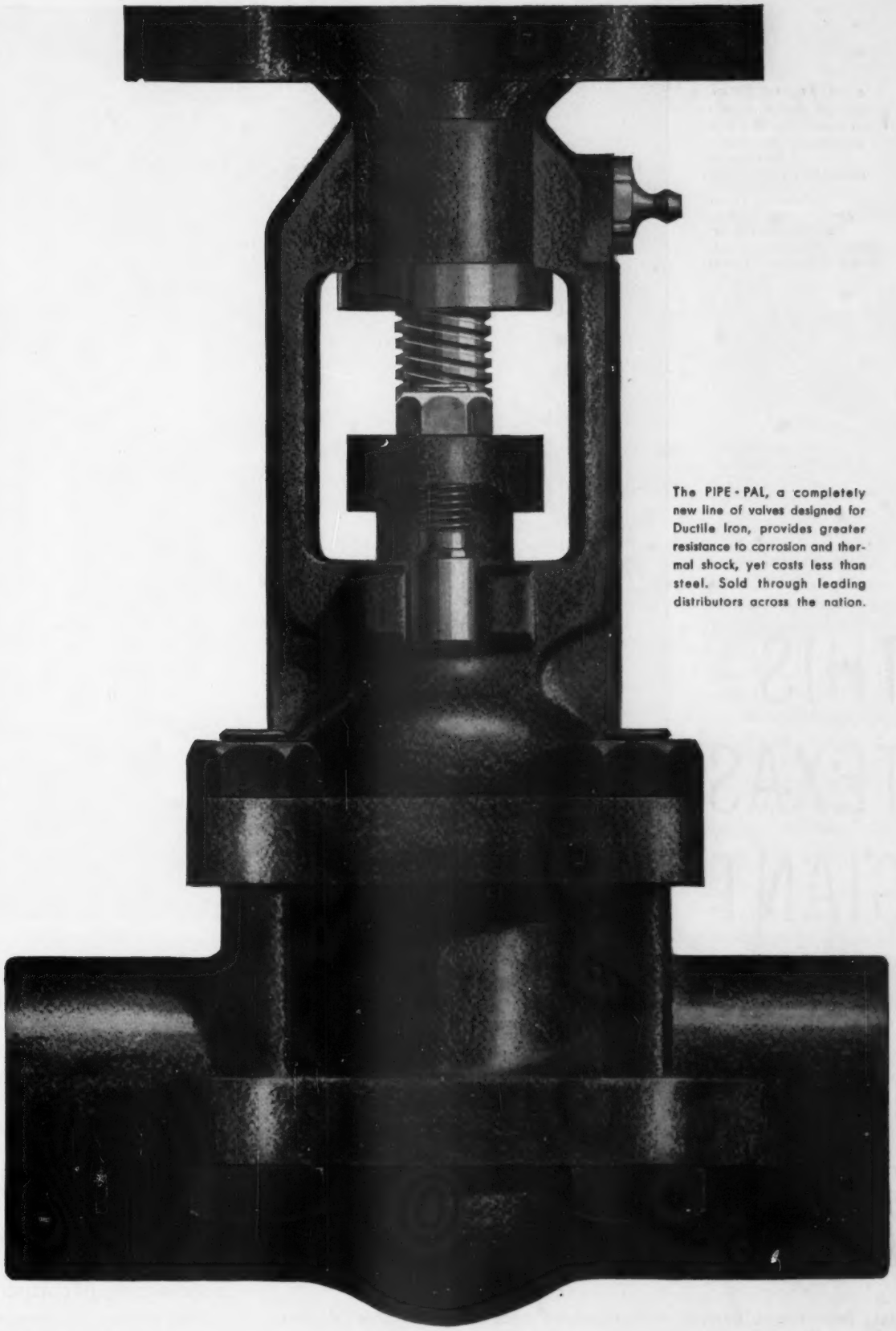
In the past, the Irish consultants have been rather limited in the magnitude of the projects they have designed, but with Ireland a World Bank member, the engineers in private practice are hoping to broaden their activities. In this effort, membership in FIDIC may help.

Other Engineering Problems

The other problems and activities discussed were:
¶ Public Relations — "The public knows what an architect is, but we must make known the role of the consulting engineer. We are trying to find the best manner to tackle this problem. Fortunately, we have no public relations problem with the government. This is a small country, and the members are known personally to most of the officials in the various government departments."
¶ Fees — The Irish consultants do not have a fee cutting problem within the profession. The Institution of Civil Engineers of Ireland circulates a schedule of minimum fees, which was prepared with the assistance of Association members. The standard fee is 6 percent of construction costs, or 10 percent if the project costs less than $6000. Not a bad fee for civil projects of some size!

The fee schedule contains one clause that could be the envy of American consultants. One-fifth of the fee is paid to an Irish consultant when a report and estimate is submitted, two-fifths upon completion of plans and specifications, and the remaining two-fifths when certificates are issued to the contractor during the course of the work.

An unusual aspect of the fee schedule is the stipulation of mileage charts that vary as the horsepower of the automobile. No Irish consultant can drive a compact car and pocket the gas savings.
¶ Education — Before 1952, mechanical and electrical engineering were covered in the same course and awarded the same degree. As a result, both still are handled by the same person in many firms. However, a division into civil, mechanical, electrical, and chemical is now the general rule. The Irish engineers also say "the engineering education is too technical. A graduate does not get the broad background necessary to become a professional man." There is a feeling that the University courses may soon be broadened, even if that means extending the time.
¶ Definition — A consulting engineer, according to the articles of incorporation of the Association is: "A person possessing the necessary qualifications to practice in one or more of the various branches of engineering who devotes himself to advising the public on engineering matters, and to designing and supervising the construction of engineering works, and who is not directly or indirectly concerned in commercial or manufacturing interests such as would tend to influence his exercise of independent professional judgment in the matters upon which he advises."
¶ Membership Qualifications — It is not easy to get into the Irish Association. A member must be a graduate of an accredited engineering school or a member of one of the Engineering Institutions (the equivalent of our Founder Societies). He must have at least seven years professional experience in responsible charge, and he must devote his entire time to consulting — or to teaching and consulting. Membership is not automatic. A prospective member must be recommended by three Association members, proposed officially by the executive committee, and elected by a two-third majority. ▲▲



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Lee's Lecture

Professional Wrestlers And Professional Engineers

JOHN F. LEE

Broughton Professor and Head
Department of Mechanical Engineering
North Carolina State College

SINCE THE WAR there has been a dedicated effort to strengthen the professional position of engineers. Most of this effort has been directed toward legal recognition of engineering as a profession, with somewhat less unified action toward the forming of a single engineering society. In some respects the professional status of engineers has been improved, but there is nothing to indicate that professional prestige has been enhanced. The recent decline in enrollment in engineering colleges compared with increasing enrollments in the basic sciences is, in fact, indicative of declining prestige. The recent acceleration of the unionization of engineers is another sign that the professional status of engineers is cracking. Yet, no profession has ever undergone such agonizing self-appraisal in the public press.

Perhaps engineering does not constitute a profession at all, and our efforts amount to no more than a frustrating attempt to prove we are something we actually are not. We would prefer to think, however, that a new appraisal, conducted within the profession with a decorum befitting private discussions might yield some beneficial results.

Legal Status of the Profession

Every state requires registration of engineers who offer their services to the public. Thus, on the face of it, the profession, or at least the consulting part of it, enjoys a legal status. However, this status is somewhat illusory for several reasons. In the first place, it is virtually impossible to define the profession of engineering with sufficient precision to prevent its practice by unregistered persons. In many states, engineering can be practiced quite legally so long as the practitioner does not represent himself as a registered professional engineer. In fact, most engineers in industry and government are not registered at all. Licensed or registered barbers have far better legal status.

Admittedly, it would be a gross mistake to enact laws designed simply to protect the professional status of a group. Any law of that type would be obviously unconstitutional. Instead, the purpose of registration laws is to protect the public against incompetent and irresponsible performance of services vital to safety and health. Professional status must be earned by gaining public respect. Few people with a serious illness would be content to follow the advice of a pharmacist or nurse. In fact, medicine is so vital to the public welfare that one would be highly incensed to discover that his physician was practicing illegally. Yet, only a small portion of the public cares whether an engineer is registered or not. And engineering registration can scarcely be considered an exclusive badge of competence, despite the examination.

Public Respect Essential

Another aspect of the registration needs to be examined in connection with the status of the profession. Theology, medicine, and law are recognized as learned professions, but universal recognition of this kind is not granted to engineering. To many people the term "professional engineer" means very little more in terms of status than "professional tennis player." To many others, engineering is a pseudo-profession differing markedly from

the "real professions" of theology, medicine, and law. Public respect for a profession is the only true protection of its status.

A parallel can be drawn between the registered professional engineer and the certified public accountant, for most accounting, like most engineering, is done by unlicensed persons. It should be noted, however, that the CPA's make no great pretensions to *learned* professional status as engineers often do. Yet, the CPA enjoys enormous prestige and is usually far better rewarded than the professional engineer. If we examine the reasons for the status of the CPA, we see that first, he serves a function for which no substitute is possible. Secondly, few accountants can measure up to the strict standards of certification so that certification is, truly, an exclusive badge of competence.

It should be quite clear that engineering cannot be elevated to the status of a profession by legislative act alone. It is necessary to look elsewhere for professional recognition before the legal status can have meaning.

Social Status of the Profession

The social status of engineering as a profession is the key to professional recognition. By "social status" we mean the respect and honor freely given by the public. The meaning here is a very nice one, for teaching has the respect and honor of the public, yet it does not enjoy the prestige of law and medicine within a context of professionalism.

Our first task is to determine what is generally meant by the term "professional" as commonly used. Engineers often complain that one of the difficulties in attaining professional recognition is the degradation of the word "engineer" to cover a wide variety of activities ranging from the supervision of a heating boiler in an apartment building at one extreme to the most basic research in astronautics at the other. What many engineers fail to understand is that a similar confusion also exists in the public mind with regard to the word "professional." Nearly everyone has heard of professional wrestlers, professional barbers, and professional prostitutes, so it is understandable if the coupling of the words "professional" and "engineer" does not call for immediate obeisance on the part of the public. On the other hand, one rarely hears of "professional priests," "professional lawyers," or "professional doctors." In our zeal for professional recognition we have failed to apply a rudimentary lesson in semantics. We cannot make engineering a profession simply by calling ourselves professional engineers; indeed, that tends to do just the opposite.

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or learning of the obstetrician. (One wonders if the early registration laws for physicians included midwives under a grandfather clause.) Yet, it is very difficult for the public to distinguish between the midwives and the obstetricians of engineering. One also can ask what claim to status as a learned profession the engineer possesses when the education of its practitioners is rarely more, and often less, than that required of nurses, X-ray technicians, football coaches, and elementary school teachers. An examination of the status of colleges of engineering in a university community, compared with medicine, law, or even physics and chemistry, would be very revealing to many engineers dreaming of eminent professional recognition.

The social status of engineering as a profession has suffered considerably from loud and raucous self-examinations conducted in public view. While this merits the greatest respect for honesty, it would appear more decorous to confine these self-evaluations to the privacy of professional councils.

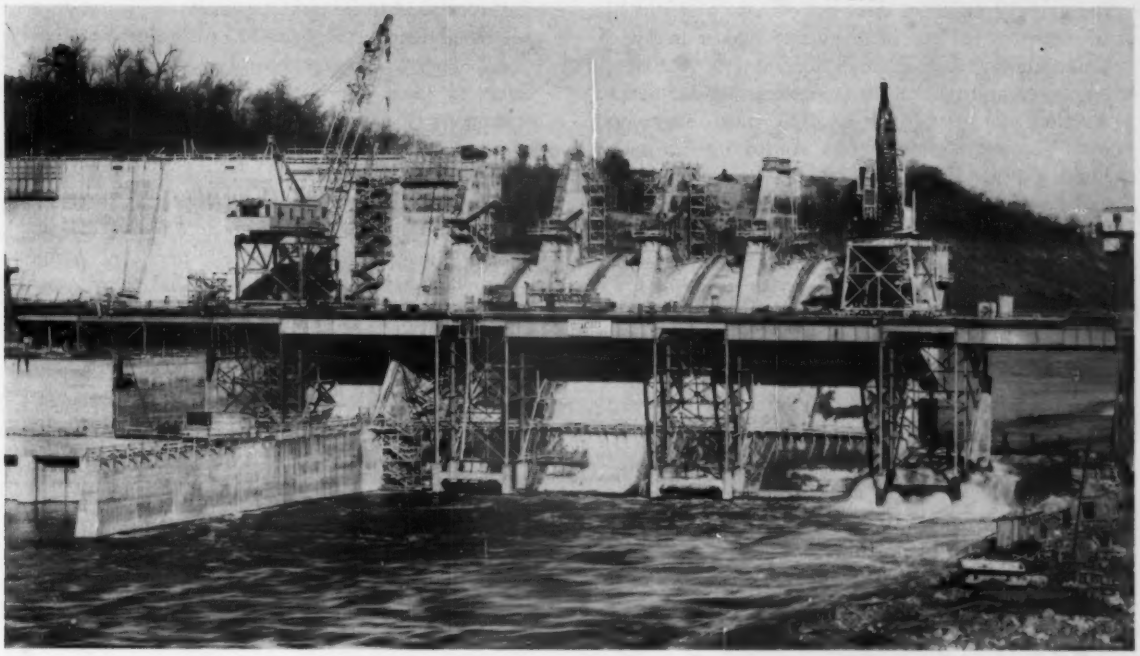
The engineering profession has failed miserably in uniting on clearly defined professional objectives. There has been too much pandering to the wishes of obsolete practitioners and too faint a heart in striking out in bold new directions.

The social status of the profession has not been enhanced by the schizophrenic group personality shown to the public. The hammer-and-tongs engineer, ignorant as he is of the rudiments of science, declares vociferously that engineering is entirely an art. The engineer who is successfully solving the complex research problems of our century feels a closer kinship to science and declares equally vociferously that engineering is entirely a science. Hence, many of the best engineering minds can be observed slipping into science or management.

Significant Terminology

This can be readily observed among the faculties of the colleges of engineering. The historical precedents are quite clear — else we should all be civil or military engineers. The important difference is that those who defect today lose all professional identity. The engineering artisans, the "practical" engineers, appear to be the loudest in developing all the trappings (and little of the substance) of a profession. These are the staunch supporters of "Science Fairs" and "Engineers' Week." They like to think of Steinmetz, Bush, Von Newmann, Carnot, and Timoshenko as "scientists" rather than engineers. The artisan engineer, however, seems quite capable of enduring his schizophrenic state indefinitely.

One cannot afford to neglect the importance of status symbols in American society. The fact that



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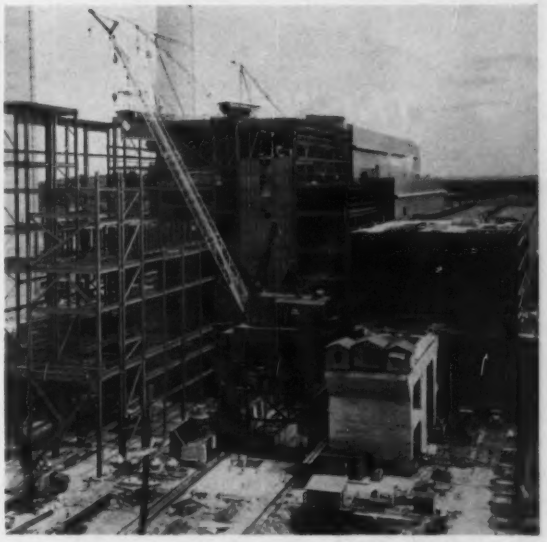

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the average engineer does not earn as much as his counterpart in law or medicine makes many of the status symbols difficult for him to get. Here, engineers and teachers share a common deficiency. Another detracting fact is that most engineers, even employee engineers in consulting firms, are hired on a salary basis while most physicians and lawyers are retained on a fee basis.

More important than these somewhat superficial, but important, factors is the difficulty of distinguishing between the "midwives" and the "obstetricians" in engineering. This leads directly to unionism where the incompetent seeks his reward on the basis of longevity and the title of engineer. Unionism is the fatal blow to claims of professional status. Yet, without high professional standards rigidly enforced by the profession, the quack will fare no worse than the true professional, and the professional rarely will fare better than the quack.

Education for a Profession

The intellectual leadership of a profession must come from the educational environment in which future members of the profession are nurtured. If those entrusted with the education of future engineers fail to see the objectives, scope, and responsibilities of the profession, then it is obvious that few graduates will be able to. Engineering educators need to be almost clairvoyant in relating present educational programs to future professional needs. The leadership required of engineering educators must be imaginative and sufficiently courageous to resist temporary expedients that represent diversions from long-range objectives.

Engineering began to emerge as a profession after the war, and at the same time the demands made upon the profession began to undergo drastic change. It was abundantly clear to nearly everyone that the education of engineers failed to prepare them for the very complex scientific problems they faced. Handbooks were no longer so useful, and pure scientists began to assume responsibilities engineers found they could not handle. At the same time deficiencies in the general education of engineers became apparent. Almost in a state of panic, engineering educators expanded programs to include more of the humanities. Course loads increased, and on top was piled a variety of new engineering courses devoted to design techniques of every new gadget. Students strained under the sheer load of work and had to withdraw from the life of the university to survive.

When it became apparent that all the techniques and a smattering of basic knowledge could not be crammed into four years, new curricula began to proliferate. Each new curriculum professed to have

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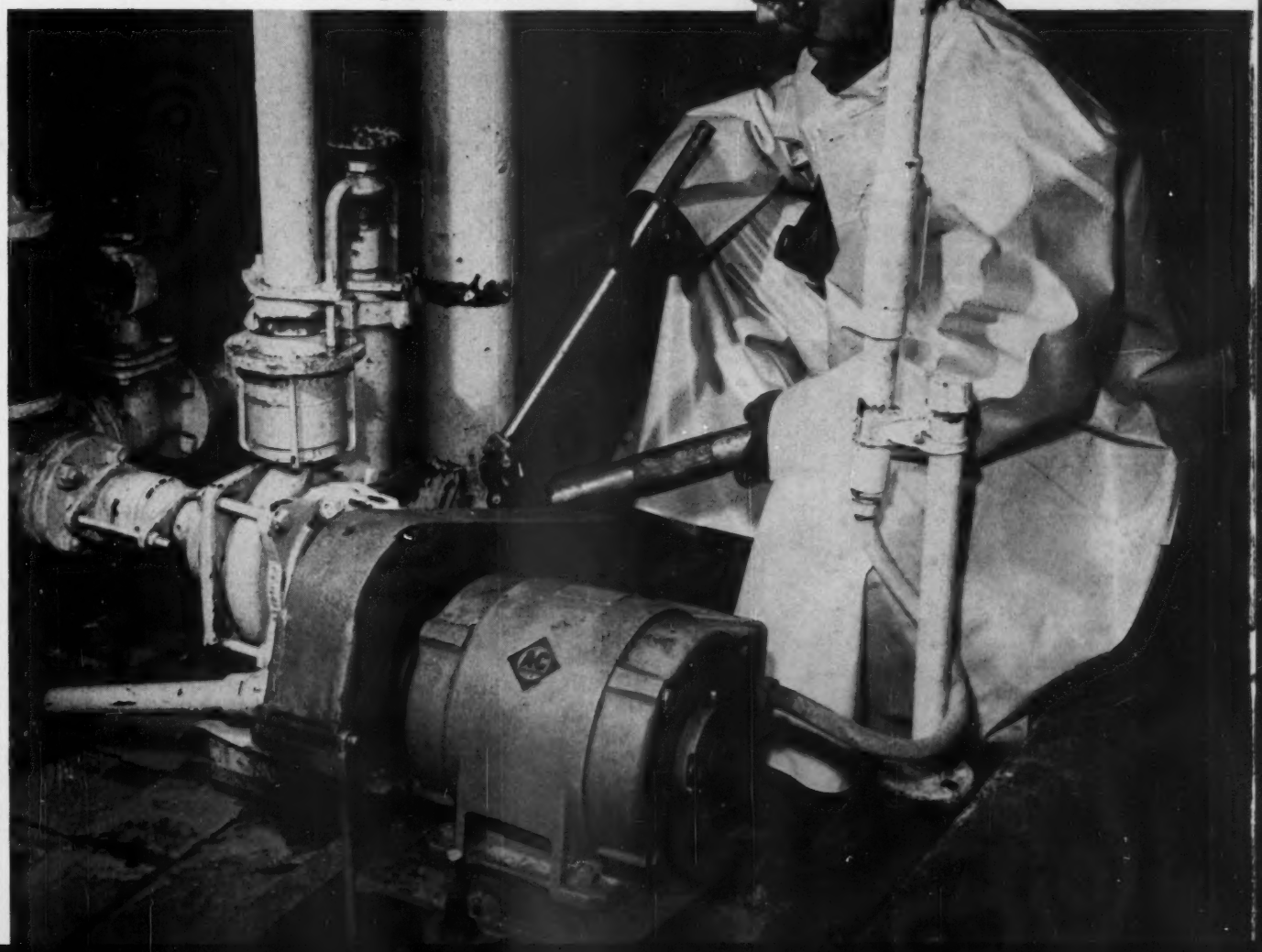

ACID AREA APPLICATION. Safety equipment and clothing are a "must" for personnel in the acid atmosphere of Dow's chlorine plant at Freeport, Texas. This *Super-Seal* motor came prepared, too — with *Poxeal* insulation guarding the stator.

the solutions to the newer problems facing engineers – and we entered the era of the catch phrase. Devotees of general engineering, engineering physics, engineering science, . . . dinned every educator's meeting with great calls to salvation. Nearly everyone agreed that we should return to fundamentals, but few could agree on what the fundamentals are. Few bothered to define the objectives of the profession, certainly the most important prerequisite to determining the fundamentals.

This entire state of confusion can best be explained as largely a reaction to traditional programs. Much of this earlier stubborness now has subsided and the traditional branches of engineering in many schools have found new directions. With the establishment of new directions, clearer concepts of the fundamentals have begun to appear. Graduate education has expanded greatly, and a natural revelation of the unified nature of engineering and science at this level has come clear.

Now we are entering a new era – one in which unfortunately all is not well, for now we have a bifurcation into the scientific versus the professional curriculum.

The professional curriculum is devoted to engineering techniques, routine engineering practices, and heavy emphasis is placed on the art of engineering. Graduates of the professional program are presumably well suited to sales, maintenance engineering, and all the drudgery brighter people would eschew. The scientific curriculum presumably would appeal to the more creative, ingenious, and intelligent. Here we have the same schizophrenia at the student level. Of course, the invidious comparisons one can draw between students in the two programs are evident. We continue to produce "midwives" and "obstetricians" and hope the public will not be confused.

In an earlier column we discussed the need to shorten the time lag between scientific discovery and the application of the discovery in the service of mankind. It was pointed out that much of Russia's recent technological success has been achieved through a sharp reduction in this time lag. Our slowness is undeniably an engineering failure. Here in this link between discovery and human use of the discovery is the essence of engineering. This is a responsibility that can raise engineering to the level of a profession. To assume this responsibility it is evident that while some engineers should be working on the frontiers of scientific knowledge, not some but all engineers must have a strong education in science. It is also clear that this education cannot be provided in four years of undergraduate study.

Let's Face Facts

The engineering profession must recognize what law and medicine recognized long ago. Four years of pre-engineering study in general education, mathematics, and the basic physical sciences are required. At the end of these four years, a bachelor of science degree (not in engineering) would be awarded. Upon completion of the pre-engineering curriculum, the student-engineer then would choose between two graduate curricula, each normally requiring three years. One curriculum would lead to the doctor of philosophy degree, thereby preparing the student for a career in research. The other curriculum would lead to a doctor of engineering degree and would prepare the student for the practice of engineering.

Fewer graduates with engineering degrees would be produced, but the level of competence would far exceed that now prevalent. Many of the routine courses found in many engineering schools would disappear from the university to reappear in technical institutes. The engineering graduate would command a much higher salary, but industry would not be plagued by the need to pay engineering salaries to those who are actually degree-bearing technicians. The status of engineering would be greatly enhanced, and much of the public's confusion would disappear. Engineering might even become a profession. ▲▲

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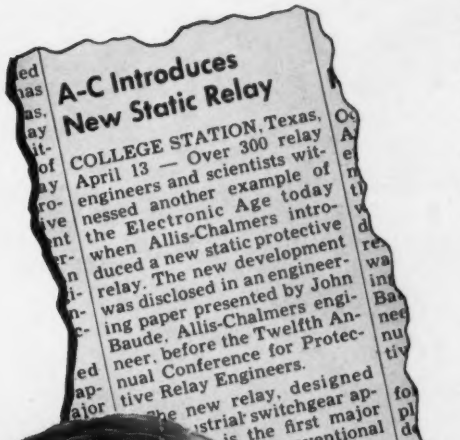

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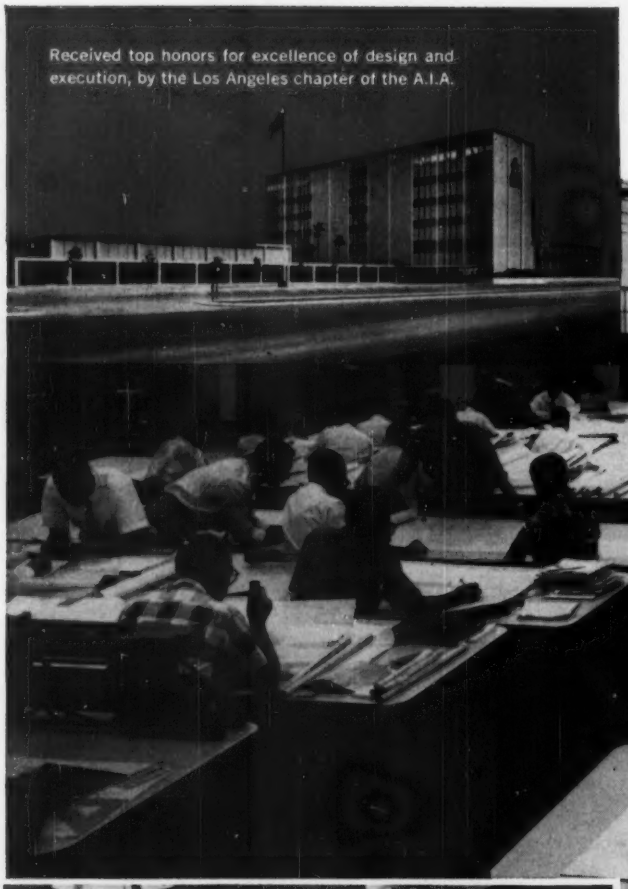

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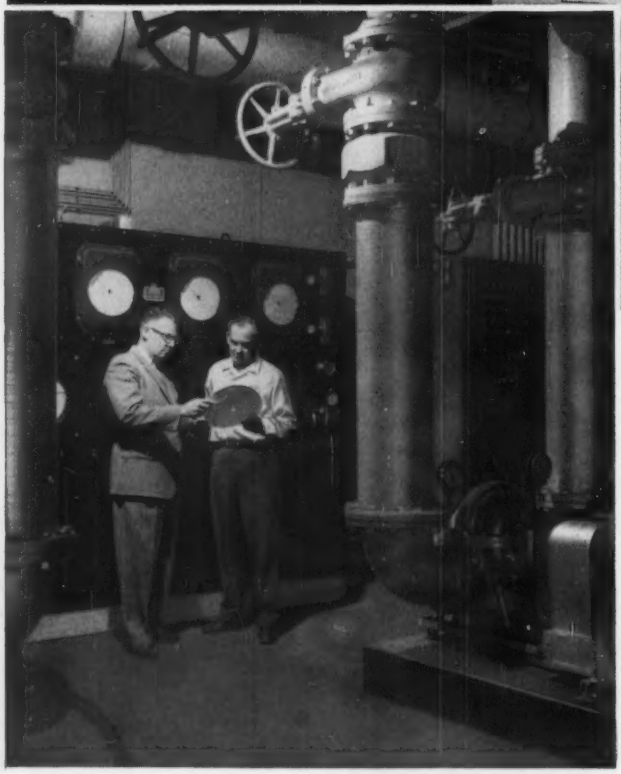

LEFT: Powers Central Control Panel includes recording, controlling, and indicating instruments, for regulating 28 supply fan systems and two 400 ton centrifugal refrigeration compressors.

Partial view of Computer and Datamation Center.

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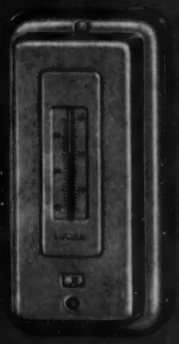

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The Word From Washington

EDGAR A. POE
Consulting Engineer Correspondent

MAIN FUNCTIONS of the new urban affairs division created within the Bureau of Public Roads are being divided into three categories — Master Plans, Highway Design, and Plans Analysis. Bureau engineers said they now expect to keep abreast, on a national basis, with new procedures and trends in city planning and design. The results will be dispatched from time to time to the Bureau's field offices and to the state highway departments to aid them in the solution of their problems.

James L. Shotwell, one of the top engineers at the Bureau, emphasized the importance of urban sections of the Interstate Highway System. He said that nearly 50 percent of the traffic will be on the urban sections of the Interstate System. Furthermore, he said about the same percentage of revenues going into the Highway Trust Fund will originate from urban areas. The urban mileage, excluding toll roads, accounts for only 4126 miles of the Interstate System, but these sections represent 42 percent of the estimated cost of constructing the system.

Shotwell said he is impressed by the emphasis that highway designers are placing on both the over-all and detailed design of highways. While the over-all basic design solution to a problem is of utmost importance, the final test as to the true operational characteristics of a facility frequently depends upon details, he said. He stoutly maintains that the high construction costs of both rural and urban freeways justify the time and expense required for proper location and design. He added that it is necessary for the locator and designer to give full consideration to road user benefits, impact on the community, traffic capacity, safety, costs, and many other items.

"The location and design of any freeway," said the engineering executive, "whether it be selecting the saddle to use in crossing a ridge in a rural area or determining the particular block best suited for the expressway location in an urban area, is a challenge to the highway engineer."

Shotwell said that some of the sections of the Interstate System constructed during the early phases of the program have unsatisfactory features that will not be used in future engineering designs.

Air Pollution Menace

Those who have given up cranberries and cigarettes now must stop breathing. Dr. Leroy E. Burney, surgeon general of the United States, says that the Public Health Service knows "cancer-producing agents are in the air we breathe." The air pollution problem, already plaguing a number of cities, is a serious one and is likely to attract more attention in both the executive and legislative branches of the Federal government. Speaking before the Engineers Club of Philadelphia, Jacques H. Houdry, vice president of the Oxy-Catalyst Company, said that industrial processes are just about as guilty as automobiles in contaminating the atmosphere, and "there is every reason to believe that before long, legislation will be passed affecting emissions of industrial waste gases. Unless industry gets busy to find and install adequate methods of control, some day it may find its plants shut down, not by strikes, but by health and air pollution officials."

GSA Building Program

The General Services Administration, Uncle Sam's housekeeper, is making a concerted effort to provide office space for as many Federal agencies and bureaus as possible under one roof. A number of new Federal buildings, involving outlays of hundreds of millions of dollars, are either under construction or being designed to house all or most of the various agencies in any particular area.

A 23-story building of steel, with an exterior of glass and metal, has been designed to house 20 Federal agencies at Pittsburgh. It is expected to cost more than $26 mil-

lion. It will be air conditioned and will provide about 800,000 square feet of space.

AEC Commitments

The Atomic Energy Commission has authorized $10 million through fiscal year 1960 under the joint United States-European Atomic Energy Community (EURATOM) research and development program. The program calls for 1 million electrical kilowatts of nuclear power for EURATOM, with reactors of United States design, over the next four or five years. The European countries are Belgium, France, Italy, Luxembourg, The Netherlands, and West Germany—the Common Market nations.

AEC has set up a deferred payment plan for enriched power reactor fuel to be supplied to foreign countries and international organizations under cooperative agreements. This arrangement applies to nuclear power projects not to exceed a combined capacity of 500,000 electrical kilowatts. A proposed nuclear power plant in Italy has been approved by the United States for benefits under the deferred payment plan. With the exception of the projected Italian plant the payment plan is available only to non-EURATOM countries.

Map Production Up

Some striking gains in efficiency and reduction of costs of topographic mapping have grown out of research by the Geological Survey, an engineering and scientific research agency of the Federal government. In 1952 approximately 14,000 topographic maps were available for public distribution, a product of 70 years. Today 22,000 maps are available, a 50 percent increase in seven years. During the past six years, while the cost of nearly everything has been rising, the cost of preparing topographic maps has been reduced by 20 percent. Ten years ago only one-fourth of the United States was covered by standard topo-

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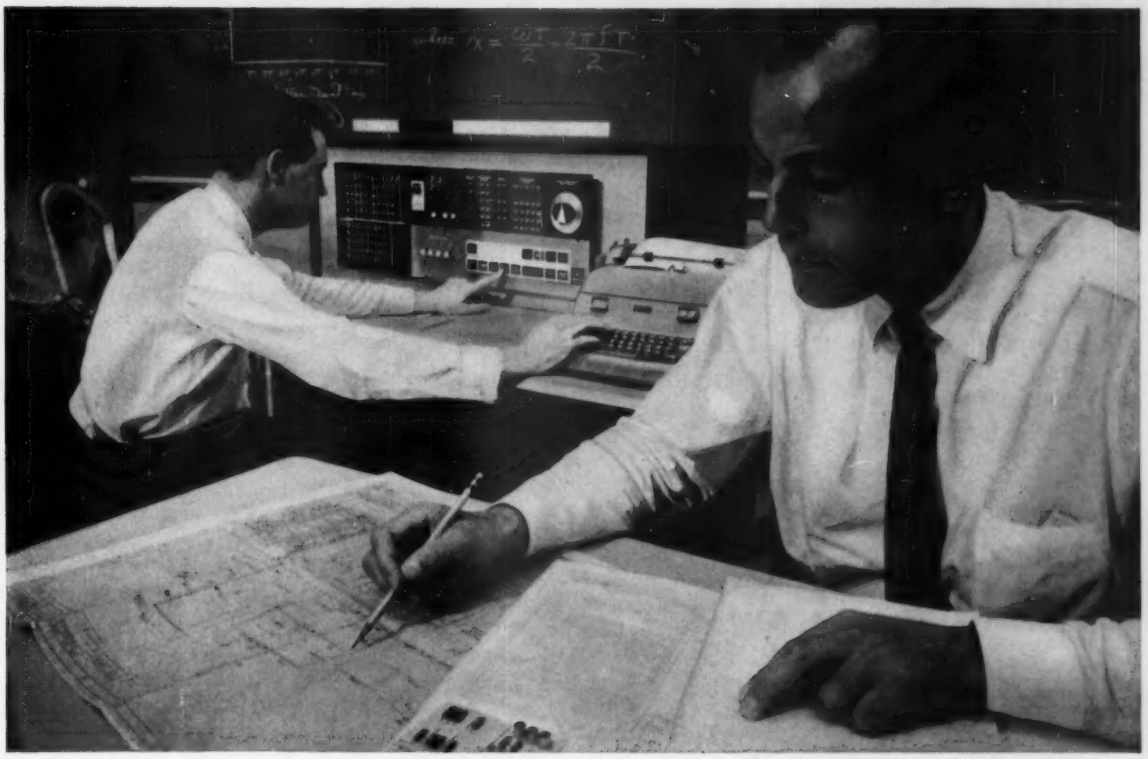

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graphic maps. Today, more than one-half of the nation has been mapped. Moreover, mapping is proceeding at the rate of 100,000 square miles a year.

Interior Secretary Fred A. Seaton maintains that there has been more progress in the technology of topographic surveying and mapping in this generation than in the last 2000 years. He points out that electronic methods are measuring distance, helicopters are now routine for transporting field parties in rugged mountains, field engineers keep in touch with each other by short-wave radio, and electronic computers are used to adjust survey data.

Latin American Power

Latin American countries have experienced great difficulty in installing sufficient electric power capacity to keep pace with expanding demands from the rapid growing cities and industries of the continent. External finance has been provided in large amounts both from the World Bank and the Export-Import Bank, but the industry has not been able to attract sufficient domestic savings for its additional capital needs.

These facts have been brought out in a study that Harvard Law School made at the request of the World Bank. The results have been published in a 304-page book. An effort was made to learn what effect regulatory policies were having on the electric power growth in Latin America. The study discloses that despite high costs of production, Latin American electricity rates have been held well below the average prevailing in the United States.

Mailing Cost Rise?

The Post Office Department, should it get its way, would raise mailing costs again in 1960. Department officials are preparing to ask Congress to increase the first class rates. A one-cent increase proposal was turned down by Congress in 1959, and is likely to be rejected again in 1960, the big election year, despite protestations by the Post Office Department that increased rates are necessary in order to reduce the $650 million a year deficit.

New Tax Ruling?

The Bureau of Internal Revenue has conducted hearings on a proposed new ruling that could make life difficult for a number of engineering organizations. Under the proposed ruling, money cannot be deducted for any activity influencing, or attempting to influence, legislation. The wording is so vague that some engineering groups could end up paying taxes on any portion of their dues that the government interprets as "attempting to influence" legislation. This also could put society newsletters in the tax limelight. At the hearings in Washington, attorneys for 46 groups including the National Society of Professional Engineers, several Chambers of Commerce, and the AFL-CIO appeared in protest.

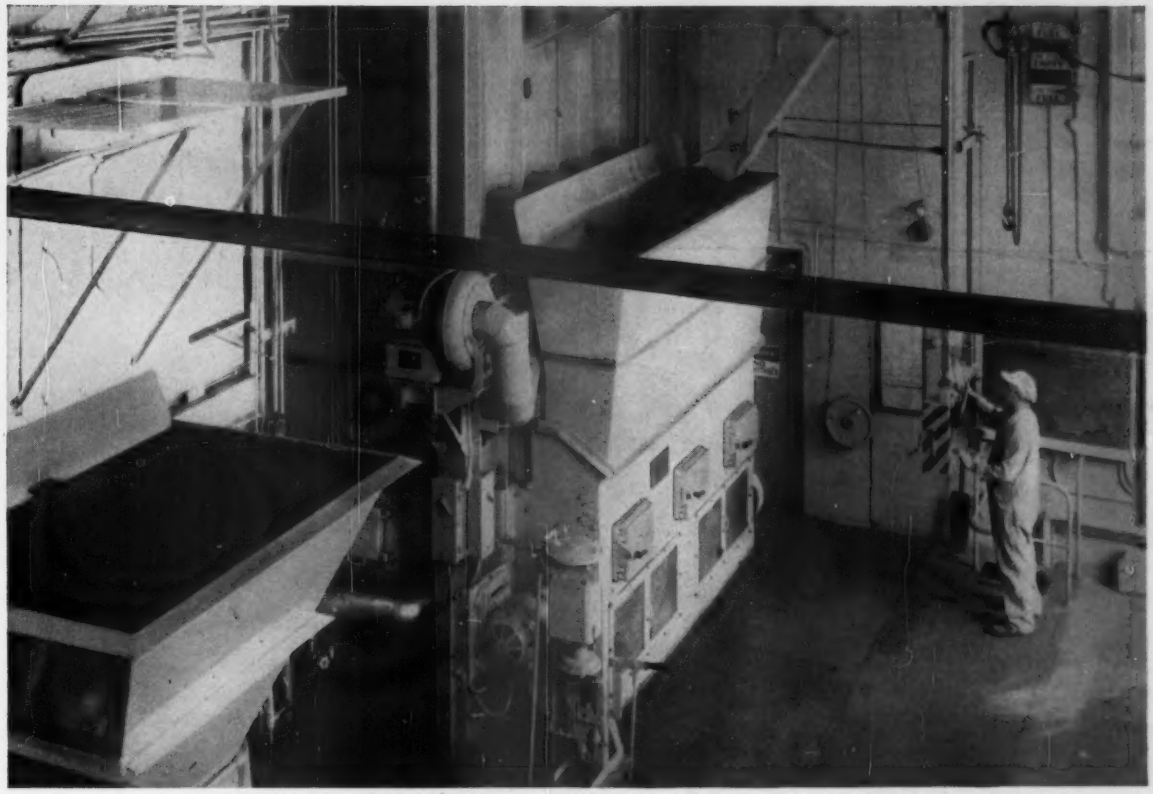
Better Highways

The American Association of State Highway Officials is making a design study of the major freeways in the United States, and in about a year the committee expects to have a comprehensive report on how highways can be improved. The chairman, R. R. Bartelsmeyer, immediate past AASHO president, stressed that the study is being made not to point a finger at consulting engineers or state highway departments which have made design errors in the past – but merely to see that the design flaws are not perpetuated in future highways.

Federal Employment

Total Federal employment increased 12.3 percent between 1947 and 1958. However, in the engineering and scientific categories of government employment it jumped 55 percent – from 84,220 to 130,870 – which would imply that

at S. C. Johnson & Son, Inc.



On the line in October 1954, this 40,000-lb B&W boiler, fired by AE Vibra-Grate Stoker, has never had an unscheduled shutdown. Cost of repairs to previous stokers ran close to $1000 per year.

Five-year repair bill for Vibra-Grate Stoker... only $188!

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consulting engineers have a legitimate kick when they complain about socialized engineering.

Roger W. Jones, chairman of the Civil Service Commission, said Federal pay scales have not adjusted in accordance with new demands for highly trained personnel. In support of his contention he cited an example. A beginning apprentice in the Naval Ordnance plant at Charleston, West Virginia, is paid $4742 a year, while an engineer with a college degree may enter the same plant at a salary of only $4490. And would this not suggest that quality may not have kept up with quantity in the astounding increase in government engineering personnel?

Sea Water Conversion

Fresh water can be produced from sea water at a cost of 42 cents per thousand gallons in a nuclear-powered conversion plant, according to a new estimate. The proposed plant would have a 50-million gallon daily capacity. The cost figure estimate, the lowest thus far presented, was from the Fluor Corporation, West Coast manufacturers and constructors. The research leading to this estimate was sponsored by the Office of Saline Water, under the Department of the Interior.

No Preference?

Dr. Wallace R. Brode, science advisor to the State Department, told CONSULTING ENGINEER in July that engineers "definitely will be included" in the work of his office. Brode, who at that time was appointing scientific representatives to foreign embassies, explained that engineers are included under the term "scientists," and he did not know where the rumor started that scientists were to receive preferred treatment in the department's appointment of attaches.

To date, attaches have been appointed in London, Paris, Bonn, Stockholm, and Tokyo. Dr. Edgar L. Piret, chemical engineering professor of the University of Minnesota, got the Paris assignment — sole appointment of an engineer.

Population Trends

The Bureau of the Census estimates that the population of the West, since the 1950 census, has increased by about 29 percent, or nearly twice the national average of 15 percent. However, the North Central states outstripped the other regions in absolute gain with an increase of about 6.6 million.

Of the four regions, the Northeast, with an increase of about 3.8 million or 10 percent, had both the smallest absolute and relative gain. Florida is the South's fastest growing state by far. It is outgrowing Texas. Florida is outgrowing California, percentage-wise, but is still far behind in total. The Bureau estimates California's current population at 14,285,000 and Florida's at 4,515,000. ▲▲

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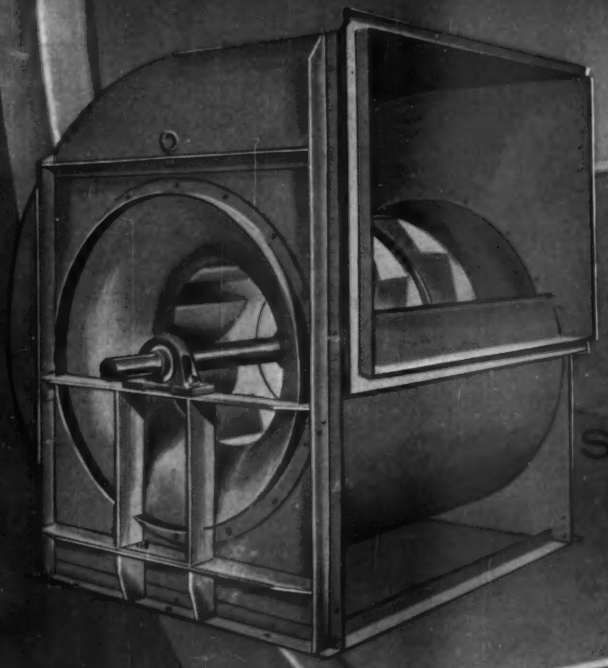

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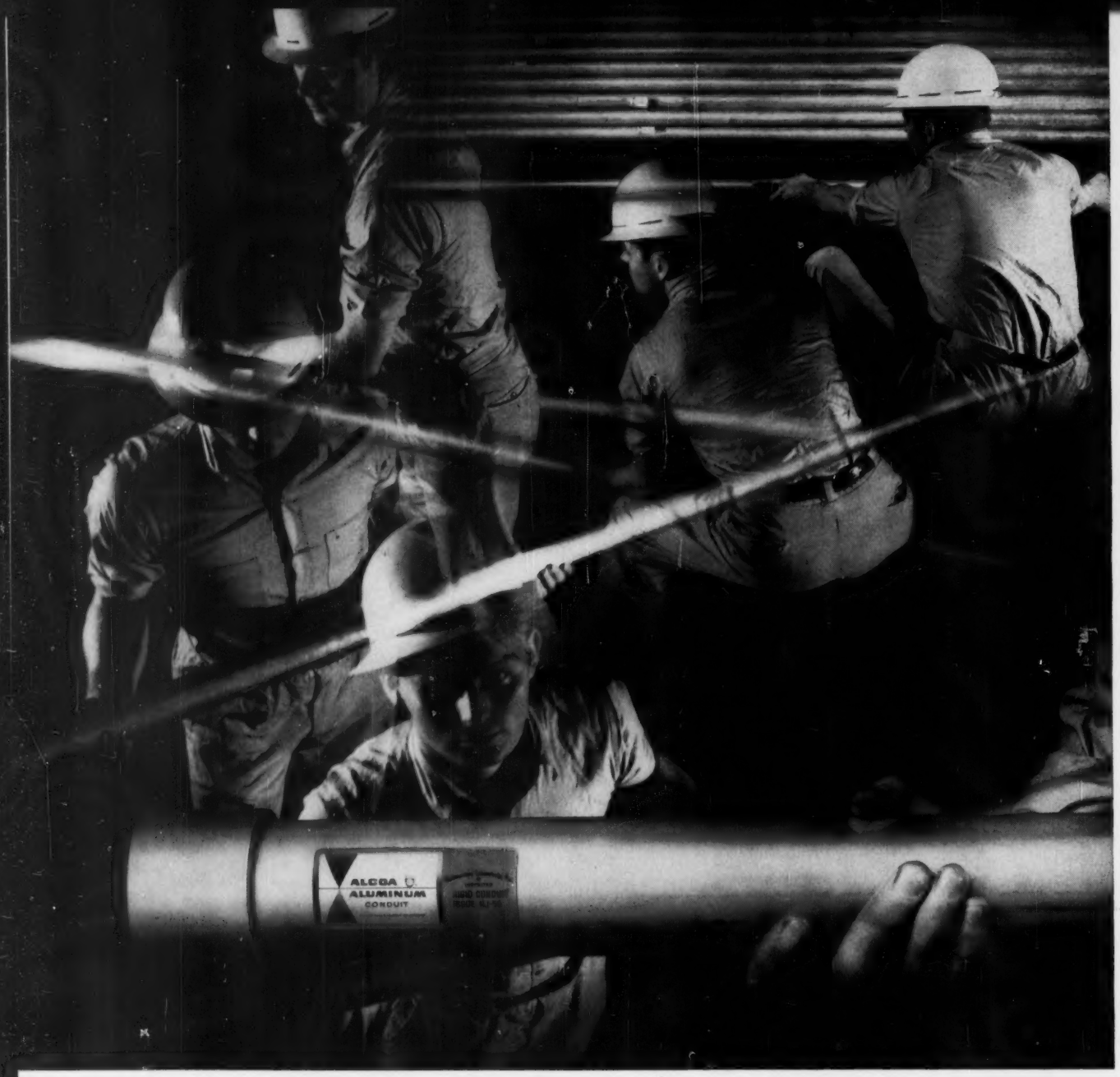

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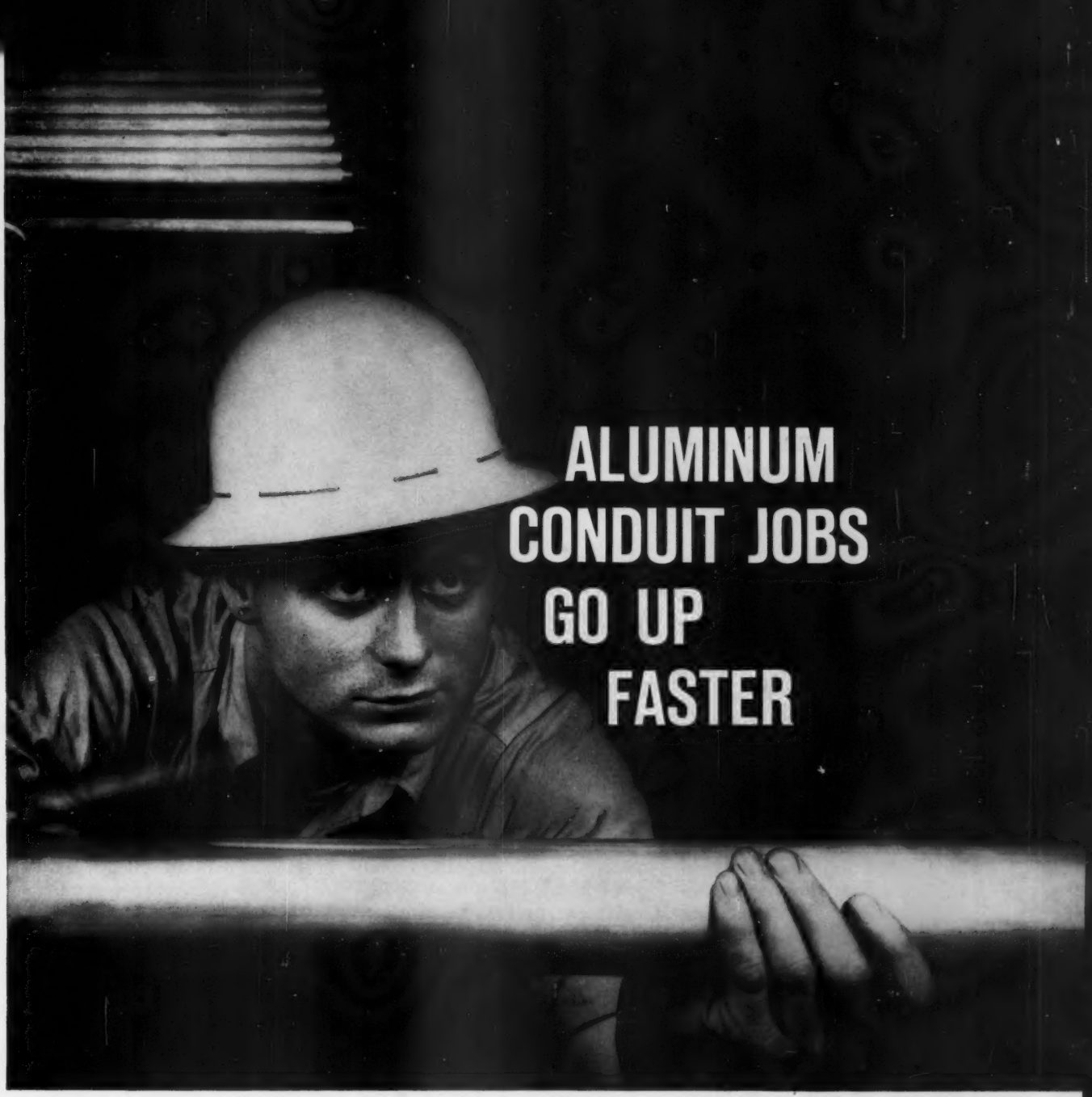

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Field Notes

MARJORIE ODEN,
Eastern Editor

BRI Conference

HEATING TECHNIQUES, metal curtain walls, sandwich panel design, and modular coordination were among the topics of discussion at the recent Building Research Institute conference in Washington, D. C., but heating easily stole the spotlight with predictions of great new things to come and warnings that designers of heat distribution systems would have to reappraise their methods.

Bright Outlook

Herbert T. Gilkey, director of technical services for the National Warm Air Heating and Air Conditioning Association, said that heating equipment now is better than its distribution systems. "Furthermore, the majority of equipment failures are directly attributable to improper application."

But things are looking up. "I believe that the heating industry is on the verge of major breakthroughs which will result in totally new designs using new materials and techniques . . . For example, a direct-fired heat exchanger of about the same size and configuration as the cooling coil on an air conditioning unit no longer stretches the imagination."

Gilkey continued with a discussion of several new heating methods now being studied. "A great deal of work has been done recently on developing methods of catalytic combustion using gaseous fuels. One device consists of a porous ceramic tube into which a gas-air mixture is fed under pressure. After the fuel-air mixture has been ignited on the outside of the tube and the tube itself has come up to temperature, essentially flameless combustion is maintained. Such units will not be on the market immediately. Nevertheless, from the engineering standpoint, a number of exciting possibilities exist. Among these are much more compact equipment, as a result of the higher energy release rate per square foot of heat exchanger and combustion chamber surface. The possibilities of higher efficiencies, lower flue gas temperatures, and simplified chimneys, resulting partly from the use of either induced or forced draft venting, also exist.

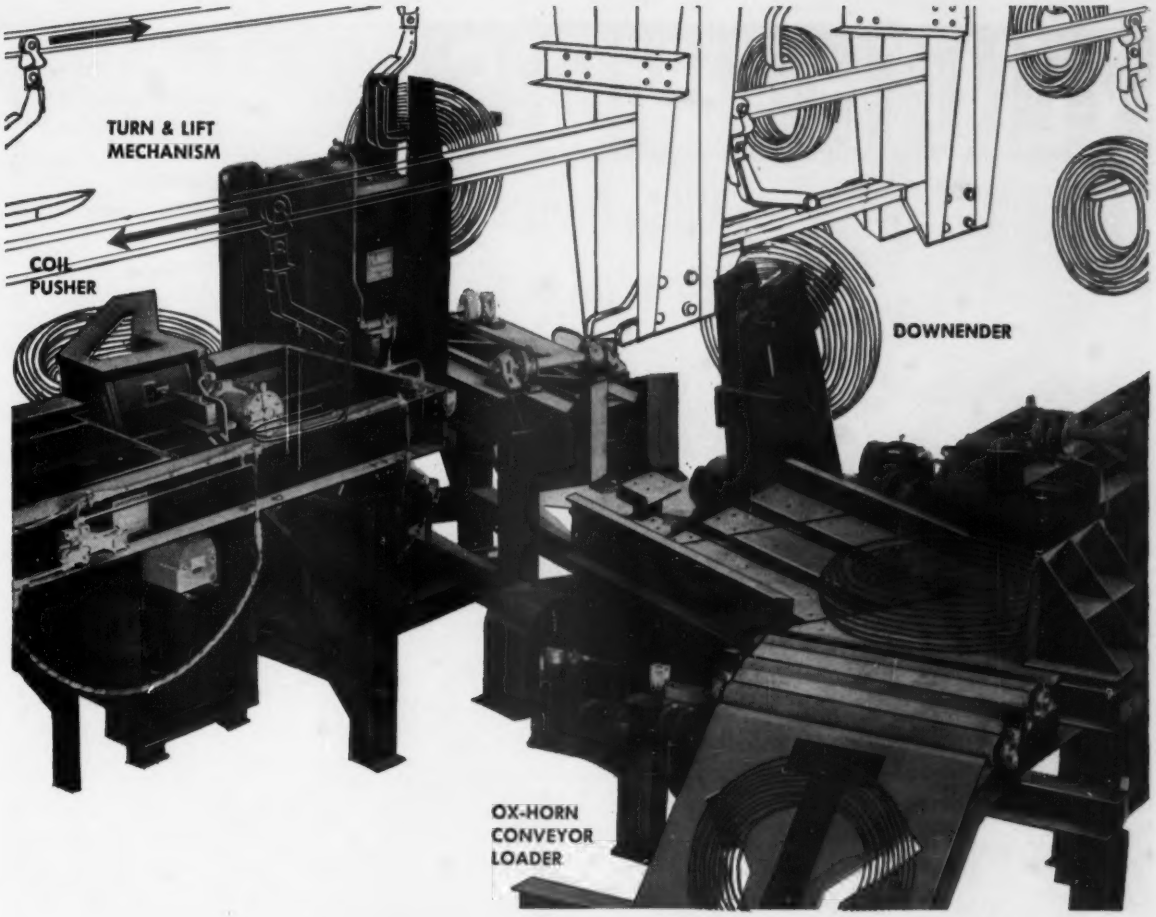
Advocates of oil heat also have been active. Gilkey explained a new combustion device "which is more revolutionary in its performance than in its concept. In this particular instance, the oil is atomized and mixed with air in a manner similar in many respects to the conventional oil burner. Rather than being blown into the combustion chamber, however, it is sucked in by an induced draft fan. In this respect it differs from conventional oil burners. Since the need for natural draft is eliminated, it is possible to exhaust the products of combustion at a much lower temperature than is conventionally required. In addition, the furnace is vented under pressure, reducing chimney dimensions and simplifying chimney requirements.

"In view of the wide interest exhibited by the various fuel industries, I am confident that these and other developments will make an increasing impact upon the heating field. They, in turn, will require reappraisal of our current design procedures for distribution systems."

Advances in Controls

Even heat controls are becoming more efficient, and getting a "new look." Beauty and improved precision received quite a bit of attention from manufacturers of heating controls a few years ago with the introduction of the electronic control system. Besides being smaller in size than their predecessors, the new controls had an added advantage in that a slight drop in outside temperatures would result in a slight increase in indoor temperatures. Now control designers have gone another step, Gilkey said.

The increased control over indoor temperatures "tended to compensate for increased radiation loss from the human body to the cold surfaces of the building, an im-



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portant consideration in structures with large window areas. This same effect has more recently been achieved using simpler, less complicated controls which do not contain electronic components. Furthermore, the control application has been modified to improve heating system response."

Future of Radiant Heating

J. Raymond Carroll, Associate Professor of Mechanical Engineering at the University of Illinois, had a few words to say about the future of radiant heating. "The ever increasing use of glass in buildings and the trend towards outdoor and open air living will dictate the future use of radiant heating. Unobtrusive elements emitting high intensity infrared could be mounted in the walls or ceiling around large glass areas to counteract body radiation loss to the cold glass area.

"In addition to the small, high intensity infrared emitter, all interior surfaces of buildings will be warmer. Naturally, one method is to use more insulation. It is possible that future walls, floors, and ceilings will have electrically conductive films embedded or adhered so that one or more of these surfaces may be varied in temperature as the exterior weather changes."

An even more original suggestion by Carroll was the use of electric drapes. "Electric blankets have been successful for years. It should be simple to develop the electric drape. This would do much to solve the cold window problem." Or how about warming the glass? "Perhaps it will be a plastic, but it will be insulated against high heat loss to the outside by additional glass or plastic surfaces."

Another Carroll prediction was radiant heat for outdoor living — porches, swimming pools, shopping centers, race tracks . . . "The electric element and the gas-fired element are both practical."

What about the home of the future? Carroll pointed out that since air circulation and temperature

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both are elements of a comfortable environment, "it is obvious that a combination of radiation control and air control will constitute the modern comfort control system of the future."

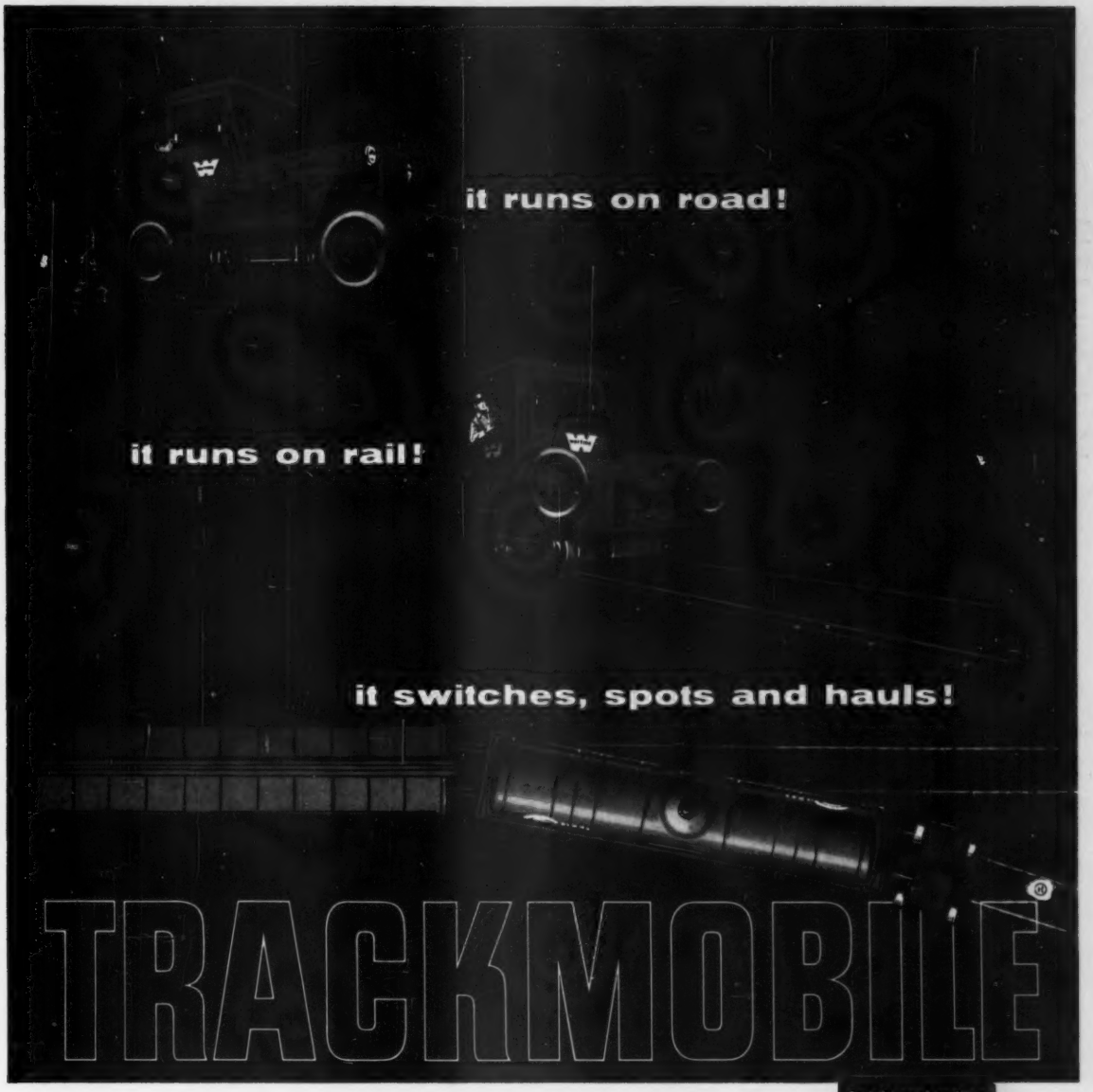
Solar Heating

Solar heating was not given such an optimistic future. Dr. R. C. Jordan, of the University of Minnesota, termed solar heat economically implausible at this time. He told of an experimental installation at Massachusetts Institute of Technology. The original equipment cost six times that of the average heating system. "Solar heat will be competitive when the equipment costs only twice as much as other heating methods." Other current disadvantages include geographical limitations; heat storage difficulties; heavy capital expenditures; and the limitations on architectural design created by the large collector surfaces required.

But Dr. Jordan predicts that within 10 years the picture could be quite different for solar heat. In the meantime he would like to see research for developing new and inexpensive materials for use in more efficient collector units.

Curtain Walls Discussed

In a discussion of curtain walls, an architect — Alfred Alschuler, of Friedman, Alschuler & Sincere — suggested architects and manufacturers get together to do something about the monotony of current panel buildings. He specifically cited, "a major building about to be perpetrated on the public that has such a wonderful flexibility in its design that you could turn it around, back side forward, down side up, or turn it on its side, or leave it as it is supposed to be and it would look just as monotonous in any position. A few more jobs like this and the public will clamor for the good old Colonial, Gothic, or Greek temples and the only architects left will be those with an aesthetic sense, a conscience,



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and no imagination. And there will be no more curtain walls. The public inevitably will rebel against 'apple crate' buildings."

Alschuler had several suggestions. Some panels could be recessed and others projected to give a building more sense of depth. Or the panels could slope in or out. "There is no law that says that panels cannot be round, spherical, diamond shaped, or free form. Consider treating different parts of a building harmoniously but differently. Combinations of the above can give endless possibilities." He added that he would, of course, not recommend using all the variations in one building.

The architect also told how the manufacturer can help vary the skylines. "Maybe the curtain wall manufacturers should be considering how to inexpensively change the colors on the exterior of the building by a re-coating process or a simple method of replacement of the exterior facing after a period of time. Perhaps plastic coverings or coatings would permit this."

Tolerances a Problem

Norman S. Collyer, president of F. H. Sparks Company, Inc., had a plea to designers. Check tolerances and clearances more closely. Under the present system, when plans and materials are received, Collyer said, "Our hope is that we may be able to complete the installation in some manner in spite of all obstacles. We may be successful, but we will never be efficient with the designs that are being handed to us.

"For example, the word tolerance usually implies a permissible or normal amount of variation, although the actual may be more. Thus the mill tolerances in a 5" by 5" steel angle may be about ¼" in either direction but the actual variation when compounded can be more. It is therefore stupid to talk of attaching aluminum extrusions directly to such an angle to get a finished product within 1/16"

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Springfield Elec. Sup. Co.

INDIANA
Ft. Wayne:
Mossman-Yarnelle Co.
Gary:
Englewood Elec. Sup. Co
South Bend:
Englewood Elec. Sup. Co.

IOWA
Des Moines:
Weston Lighting, Inc.

KANSAS
Kansas City:
W. T. Foley Elec. Co.

KENTUCKY
Louisville:
Henry J. Rueff Co.

LOUISIANA
Baton Rouge:
Electrical Wholesalers Inc.
New Orleans:
Interstate Elec. Co.

MAINE
Bangor:
Standard Elec. Co.
Portland:
Holmes Elec. Supply Co.

MARYLAND
Baltimore:
Excello Public Serv. Corp.
Salisbury:
Artcraft Elec. Sup. Co.

MASSACHUSETTS
Boston:
Mass. Gas & Elec. Light Co.
Henry L. Wolfers, Inc.
Pittsfield:
Carr Supply Co.
Springfield:
Eastern Elec. Sup. Co.
Worcester:
Atlantic Elec. Sup. Co.
Benjamin Elec. Sup. Co.

MICHIGAN
Detroit:
Madison Elec. Co.
Michigan Chandelier Co.
Flint:
Royalite Co.
Grand Rapids:
Purchase Elec. Sup. Co.
Jackson:
Electric Wholesale Sup. Co.
Pontiac:
Standard Elec. Co.
Saginaw:
Schmerheim Elec. Co.
Standard Elec. Sup. Co.

MINNESOTA
Duluth:
Northern Elec. Sup. Co.
Minneapolis:
Charles A. Andersen & Co.
Northland Elec. Sup. Co.
St. Paul:
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MISSOURI
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NEBRASKA
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White Elec.
Omaha:
Electric Fix. & Sup. Co.

NEVADA
Reno:
Western Elec. Dists. Co.

NEW HAMPSHIRE
Portsmouth:
Mass. Gas & Elec. Light Co.

NEW JERSEY
Atlantic City:
Franklin Elec. Sup. Co.
Cherry Hill:
Delaware Township:
Flynn's Camden Elec. Fix. Co.

NEW MEXICO
Albuquerque:
The Lighting and Main. Co.

NEW YORK
Binghamton:
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Buffalo:
Buffalo Incand. Light Co. Inc.
Niagara Falls:
Wysen Supplies Inc.

NEW YORK (cont.)
Poughkeepsie:
Electra Sup. Co.
Rochester:
Rowe Electric Sup. Co.
Syracuse:
Superior Elec. Corp.

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Charlotte:
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Durham:
Noland Co.
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Kinston:
Kinston Elec.
Winston Salem:
Noland Co.

NORTH DAKOTA
Fargo:
Northwest Elec. Sup. Inc.

OHIO
Akron:
The Sacks Elec. Sup. Co.
Canton:
Electric Sales Co.
Cincinnati:
B. & D. Elec. Co.
F. D. Lawrence Electric Co.
Richards Elec. Sup. Co.
Cleveland:
The H. Leff Electric Co.
Midland Elec. Co.
Columbus:
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Erie:
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Hazleton:
Power Elec. Co. Inc.
Kingston:
Anthracite Elec.
New Castle:
Midwestern Elec. Co.
Philadelphia:
Ace Lighting Fix. Co.
Gold Seal Elec. Sup. Co.
Sylvan Elec. Fix. Co.
Pittsburgh:
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Argo Lite Studios
Reading:
Coleman Elec. Co.
Scranton:
Lewis & Reif, Inc.
Uniontown:
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RHODE ISLAND
Pawtucket:
Major Elec. Sup. Co.
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TENNESSEE
Nashville:
Nashville Elec. Sup. Co.

TEXAS
Austin:
Southern Electric Sup. Co.
Dallas:
Rogers Elec. Sup. Co.
Ft. Worth:
Anderson Fixture Co.
Houston:
Gross Electric Supply
Martin Associates
Southern Electric Supply Co.
Lubbock:
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San Antonio:
Southern Equip. Co.
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or 1/32". Yet such details appear on drawings daily. An aluminum extrusion may be exact to dimensional size or thickness within a few thousandths of an inch. But this same extrusion may be twisted or out of line in a 20-ft length.

"When checking tolerances in any material, check not for the possible cross section size variation but for the total variation in both directions from any given plane for the full length of the member. This is tolerance as the builder must work with it."

As he pointed out, "The designer sets the pace for the entire job from beginning to end. It is essential that the designer give more attention to the erector's problems if we are to have efficient erection of metal curtain walls and avoid future problems."

It turned out that the roofing industry also has problems. M. D. Chamberlain and E. F. Bennett, of Koppers Company, Inc., explained that "the problem of wrinkling of cover-over joints in insulation may be due to dimensional change, warping of the insulation, water vapor pressure from moisture trapped in the insulation, or a combination of these factors." If an owner who has this wrinkling problem gives up and has a new roof put over the same installation, he usually gets the same wrinkling problem again. Various attempts have been made at venting during construction or after a roof is in distress, but there is no adequate solution to the problem at present.

Technical Thesaurus Proposed

Among the other interesting papers presented was one by Eugene Wall, of the E. I. du Pont de Nemours & Co., Inc. He is interested in better documentation of building research data, and pointed out that "any retrieval system must detect the situations in which more than one word or phrase may be used to describe a specific concept and make provision for cross-reference so that a searcher will be able to retrieve essentially all pertinent information on the concepts in which he is interested."

Wall had an interesting suggestion to help solve the problem of the file clerk and the searcher whose free association vocabularies don't match a technical thesaurus.

"Numerous experimenters have pointed out that the vocabulary of any one field of technology is limited to approximately 5000 items, that the vocabulary of all technologies is limited to 20,000 terms, and that the whole of human knowledge could be expressed in less than 40,000 terms."

He added that "the creation of such a technical thesaurus is not merely a theoretical possibility. We in the du Pont engineering department have constructed a thesaurus for use in information storage and retrieval. We consider it essential if we are to achieve an effective system." ▲▲

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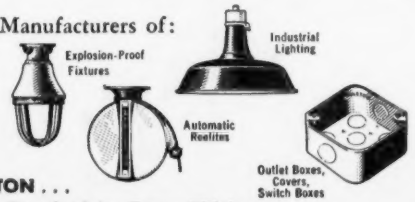

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Books

Parallel Reading for Consulting Engineers

Within 40 years of its beginnings (around 1895) the American automobile industry became the world's biggest manufacturing enterprise.

As Professor Rae notes in his new book, *American Automobile Manufacturers: The First Forty Years*, "none of this had to happen." No determinist, historian Rae writes the story of this phenomenal growth in terms of men, decisions, chance, invention, finance, management, and objective factors – in short, in terms of the complex interplay of history.

One group of men especially interesting to the author is the technically trained, whether the training was received in college or at work. This interest is focused on their activities as businessmen – not simply as technicians. Proponents of engineering or technical training as a background for the business career will find support in Professor Rae's conclusions.

He concludes that among the near common denominators of the successful business leader in the automobile industry is technical training, whether in the form of a college education or intensive practical experience as a mechanic or machinist. Other common denominators of the business leaders – and it is important to emphasize that Rae is speaking of the executive or manager (or even owner) and not leading engineers – were a middle-income background and an enthusiasm to make automobiles.

Those singled out as the "greats" in the first 40 years are Henry Ford (a mechanic who exploited the potentialities of mass production); Alfred P. Sloan (an MIT graduate who brought a sound organizational structure to General Motors); W. C. Durant (who had vision and drive manifesting itself in the grandeur of the General Motors concept); Walter Chrysler (a mechanic who created one of the "Big Three" from an insolvent company); and Ransom Olds (who owned his own machine shop before he established what ultimately was the first successful automobile plant in Michigan).

Rae reminds the reader, however, that the first 40 years of the industry exhibited characteristics which may well prove peculiar to a lusty infant in industrial history – the first basic decisions in the industry, for example, were technological (steam, electric, or petroleum power plant). Incidentally, the American engineers wrestled mightily with technological problems that had long been solved in Europe, where basic inventions and developments were made, and where "an automobile manufacturing industry [was] firmly established and in regular commercial production in the early 1890s, while the American pioneers were still experimenting and doing so in rather astonishing ignorance of what was going on across the Atlantic." (This may correspond to our ignorance of Russian research.)

Rae, who is a student of business and technological history, set out to make this book a case history for testing some of the abstractions prevalent among historians of business. He finds that the industry did not settle in Detroit because of banker finance or unique transportation and natural resource factors, but because "the" men settled there. He does not believe that the industry witnessed the growth of a "Big Three" (oligopoly) because the monopoly oriented prevailed but because technological problems and solutions demanded amalgamation. He does not credit Henry Ford (or any of his colleagues) with the development of mass production (interchangeability, assembly line, subcontracting) but with the application of it on a grand scale to the manufacture of automobiles.

Ford emerges from the study as a skilled technician with a commendable singleness of purpose (the mass production of the automobile) and an unfortunate stubbornness (the unwillingness to alter proven solutions even after the nature of the problems change). William Durant, the founder of General Motors, never loses his vision and enthusiasm – even when events disillusion his financial backers and General Motors crumbles about him. George Seldon, holder of the famous – or infamous – master patent of 1895 on an internal combustion motor car fares well in Rae's hands although the patent suffered an inglorious fate in the clutches of the Electric Vehicle Company.

While Rae never lets his reader forget that men make history he does not neglect the history of the manufacturing firms – the great and the small (there were 108 companies engaged in auto manufacturing as late as 1923), the successful and the unsuccessful (only 44 companies were engaged in automobile manufacture in 1927). General Motors, too, has had its troubles, and the Ford Company tasted the bitter cup when in two short years it fell from an "unassailable" position of market domi-

nance to that of runner-up to Chevrolet (1927).

General Motors' grand proportions and impressive troubles were fascinatingly intertwined with the erratic career of Durant. In 1908, when the Model-T was born, he set out to "conquer the automotive world." By 1910, "the affairs of General Motors were in chaos," but monumental chaos; by 1915 (Durant had been removed from active management for five years), the "water that Durant had poured in had been wrung out"; but by 1916 Durant was once again in clear control of General Motors. He lost out again — and again — and at the age of 75 he filed a petition of bankruptcy: assets — $250; liabilities — $914,000 (in the same year he opened a supermarket in Asbury Park, New Jersey).

Engineers interested in technological and business history may well find Rae tailored to measure — the automobile enthusiasts will certainly learn more about the men and companies responsible for putting almost 3000 makes of automobiles on the American roads (there were Fords, Chevrolets, and Plymouths, but there were also Velies, Auburns, Elcars, and Moons).

Thomas P. Hughes
Associate Professor of History
Washington and Lee University

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Yale University Press has just published *New Light on Dr. Johnson*, further described by subtitle as "Essays on the Occasion of his 250th Birthday." If these essays, even collected, fail to properly celebrate so grand an occasion, the lack is made up by a good start toward the publication of all the *Works of Samuel Johnson* by the same press, and a continuation of the publication of the *Boswell Papers (Boswell for the Defence)* by McGraw-Hill.

The average reader with less than an overwhelming interest in bibliographical matters may find some essays in *New Light* a bit

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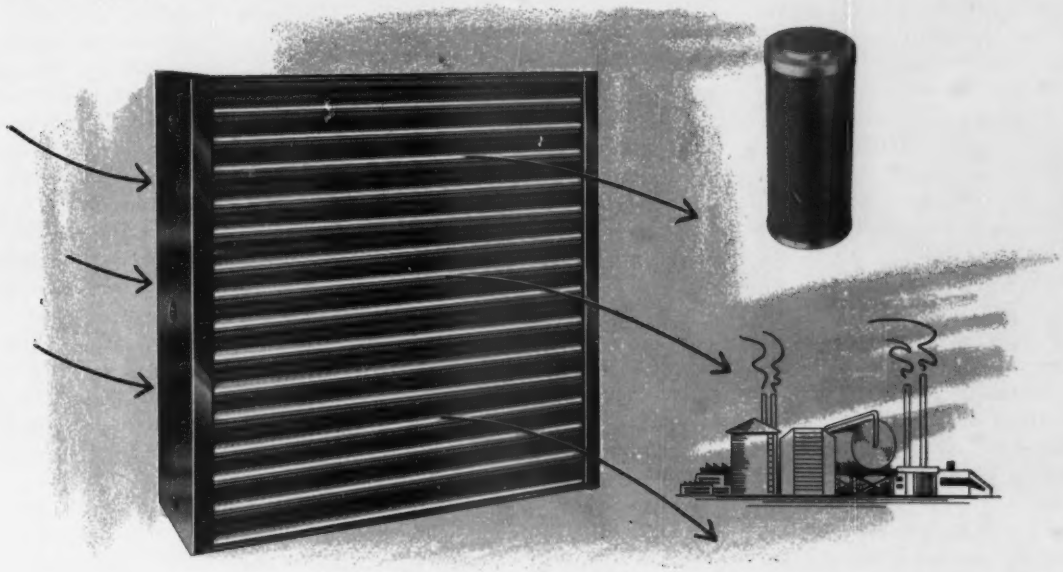

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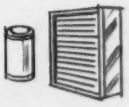

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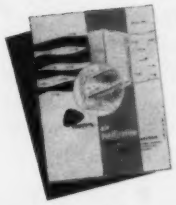

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precious, but the consulting engineer is bound to find "Johnson's 'Dissertation on Flying,'" by Gwin J. Kolb, of the University of Chicago, a readable and even educational piece, if for no other reason than that it will introduce John Wilkins, and his book, *Mathematical Magick* (1648). According to Kolb, Johnson got much of his background on sailing chariots and flying machines, which he describes in his book *Rasselas*, from John Wilkins, and enough is quoted from Wilkins to suggest that he deserves reprinting, at least in part.

There are other essays in the group to be recommended to the general reader, particularly "Johnson's Dictionary" (Wimsatt), "The Dark Hints of Sir John Hawkins and Boswell" (Pottle), and "Dr. Franklin Meets Dr. Johnson" (Quinlan).

And if you happen to be one of the rapidly growing group of Johnson admirers, this is one you will have to have. Fact is, there are now more than enough Johnson fans to assure the financial success of nearly any publication dealing with the good doctor.

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Regular readers of CONSULTING ENGINEER are likely to be most recently familiar with Isambard Kingdom Brunel as the young man who carried out his father's designs in the construction of the first tunnel under the Thames. A good description of this project and Isambard Brunel's role was published in the November issue of this magazine, with the title "Under the Thames to Wapping." Others may be more familiar with the younger Brunel as the engineer for the Great Western Railroad and the mammoth *Great Eastern* Steamship.

A new biography of Isambard Kingdom Brunel has just been written by L. T. C. Rolt, an engineer who gave up engineering in 1934 to open a garage and concentrate on veteran and racing cars. This vocation seems to have left Mr. Rolt considerable extra time, for he has become a rather prolific author, and he is a founder of several organizations including the Vintage Sports Car Club, the Inland Waterways Association, and the Tal-y-Lyn Railway Preservation Society. Mr. Rolt, as this background would imply, is an Englishman and lives in the village of Stanley Pontlarge, near Winchcombe.

Isambard Kingdom Brunel is just about as well known in England as Edison is in this country, though Brunel, unlike Edison, was truly an engineer rather than an inventor. He was well educated, having studied at the College of Caen in Normandy and at the Lycee Henri-Quatre in Paris, and it is said that he had mastered Euclid by the time he was six years old.

This is a competent biography of a great engineer written by a more than competent writer. We can recommend it to every consulting engineer, assuring him that he will find here not only fascinating biography but a text that deals intelligently with the personality of the man and with his work as an engineer.

The last publication in this country to deal in detail with Brunel was *The Great Iron Ship*, by James Dugan, which originally appeared as a series of profiles in the *New Yorker*. Rolt refers to Dugan's book as "a very racy account of the career of the *Great Eastern*." He has nothing better to say about it, and he carefully points out that his bibliography does not include this recent piece of writing, but is based upon "other sources, mainly original." If Dugan's account was "racy", it was also a fascinating story, but where there is disagreement, as for example, where Dugan says that the skeleton of a riveter and his son were found in the hull of the *Great Eastern* when it was broken up, and Rolt says "not so," we would be inclined to believe Rolt. Yet, there is nothing about this biography that is dull merely

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Books Reviewed in This Issue

American Automobile Manufacturers: The First Forty Years, by John B. Rae; Chilton Co., 56th & Chestnut Sts., Philadelphia 39, Pa.; $6.00.

New Light on Dr. Johnson, edited by Frederick W. Hiller; Yale University Press, 2162 Yale Station, New Haven, Connecticut; $6.00.

Isambard Kingdom Brunel, by L. T. C. Rolt; St. Martin's Press, Inc., 175 Fifth Ave., New York 10, N.Y.; $6.00.

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New Technical Books

AN INTRODUCTION TO PLASTICITY, by William Prager; Addison-Wesley Publishing Co., Inc., Reading, Mass.; $9.50. This book is based on a series of lectures given at the Federal Polytechnic Institute in Zurich and originally published in German in a Swiss edition in 1955. It is designed to supplement standard texts on strength of materials and theory of structures, which are primarily concerned with elastic behavior. By restricting the book's scope to selected topics from the theory of perfectly plastic solids, the author is able to cover the field up to and including current research without presuming prior familiarity with the subject.

ESTIMATING STRUCTURAL STEEL by George S. Sanders; McGraw-Hill Book Co., New York, N. Y.; $9.50. This book provides a broad coverage in the estimating of structural steel, structural aluminum, and other miscellaneous items used in the fabrication of modern structures. Both shop and field fabrication are included with emphasis on the estimators' point of view.

Organization and procedures for the estimating department are described and details for estimating columns, beams, connections, and built-up sections are provided. Supplementary material includes such things as Lally columns, gratings, joists, studs, and spirals.

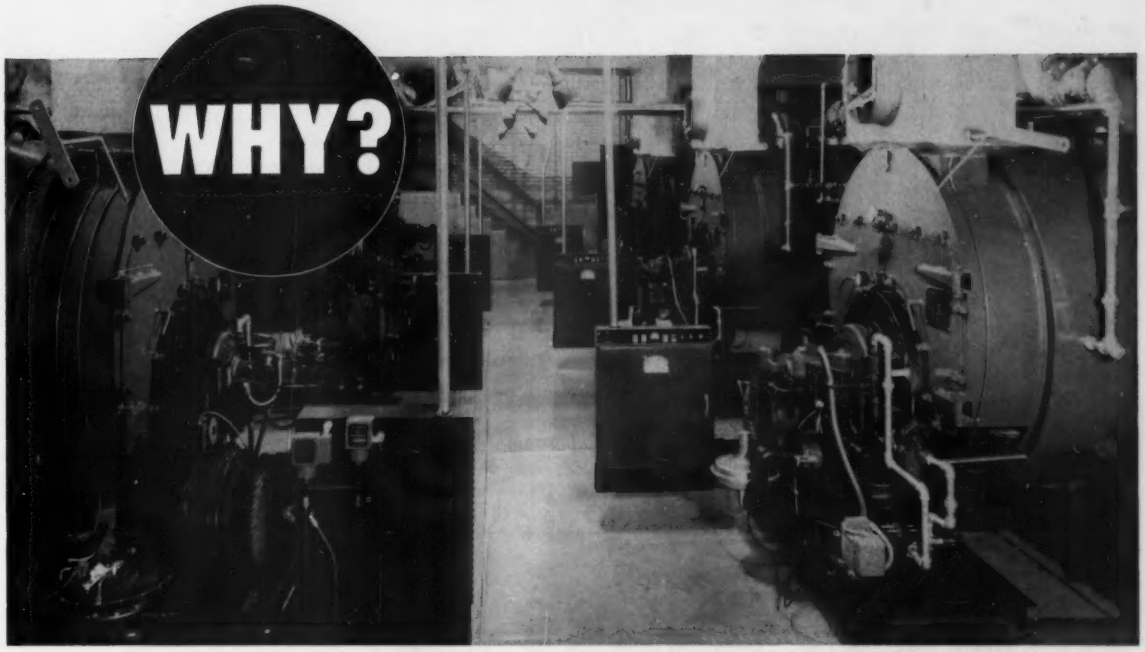
The author is well qualified by his 40 years as a professional estimator in the medium and heavy steel construction field and is identified with such structures as Radio City, the George Washington and Triborough Bridges, and several of the Wall Street skyscrapers.

ENGINEERING ECONOMICS FOR PROFESSIONAL ENGINEERS' EXAMINATIONS, by Max Kurtz; McGraw-Hill Book Co., New York, N. Y.; $6.50. This is one of a series of books presented by the publisher for the primary purpose of preparing the student or would-be professional engineer for registration. Since the required examinations in most states are necessarily comprehensive it follows that the coverage of these subjects should be, too. Unfortunately, this is not the case.

As a matter of definition, the licensing boards of the several states agree on what engineering economics consist of – the author does not. If the title read simply *Engineering Finance* or even *Business Administration for Engineers*, the text would be adequate. However, as Kurtz states, ". . . the problems given by many of the states . . . under the designation of engineering economics encompass, in addition to economics alone, such topics as basic law and professional ethics . . ." His solution is to lump these subjects (along with others) in a catchall last chapter which he himself admits is inadequate.

The section on ethics of the profession is nothing more than transcripts of the Canons of Ethics for Engineers and an out-of-date and incorrect version of the Code of Ethics of ASCE. There is no discussion of ethical practices or any relation of ethics to economics. It is handled as an afterthought, something to be handed out at the door at the end of class. Almost as disheartening is the section on legal

3 big boilers replaced by 6 small boiler-burner units



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phases of economics. For example, although contracts are discussed at length, as they should be, a coverage of the laws of real property is considered unnecessary.

The reader gets the impression here of unwarranted enthusiasm at publishing or perhaps promotional level. At any rate, the publisher's blurb states that ". . . with this handy guide within reach, you need not refer to any other books, charts or tables to find the information you want . . ." Fortunately, the author does not agree; he recommends further reference.

PROS AND CONS OF LEASING, by The Foundation for Management Research, 121 West Adams Street, Chicago, Illinois; free. Originally a big-business technique, the leasing of equipment to small businesses is steadily increasing. Leasing is valuable to an organization whose growth is impeded by shortage of capital, or whose modernization is dependent on using up its short-term or long-term credit for purchasing. While the gross dollar cost of leasing is greater than purchase by cash, the net cost of leasing is found to be less than any other method of acquiring equipment. The reason is that leasing offers tax advantages and the use of capital. Despite the misleading subtitle, this booklet is worth serious study by the consultant whose own business is growing or whose projects may entail the leasing of equipment by the client or the contractor.

NOISE CONTROL, published by Building Research Institute; National Academy of Sciences, 2101 Constitution Ave., Washington, D. C.; $5.00. New construction methods such as panel walls and lighter interior walls coupled with the increased use of mechanical equipment as in high velocity air conditioning and ventilating systems have produced a multitude of noise control problems. This book presents an analysis of these problems and the recommendations of experts on how to design and specify in order to control noise.

ACI STANDARDS 1959, published by the American Concrete Institute, P. O. Box 4754, Redford Station, Detroit 19, Mich.; $5.00 ($2.50 to members). This is the official edition of ACI Standards as reprinted from the Journal of the American Concrete Institute. It contains all current standards with the exception of the *Manual of Standard Practices for Detailing Reinforced Concrete Structures* ($4.00 or $2.50 to members) which because of its size and scope must be ordered separately. They are both standard reference works.

NATURE & PROPERTIES OF ENGINEERING MATERIALS, by Z. B. Jastrzebski; John Wiley & Sons, Inc., New York, N. Y.; $11.00. Basic to the practice of engineering as a profession is a thorough knowledge of materials and their practical use. In this clearly written and necessarily detailed book the engineering viewpoint is foremost, tying together with practical experience the essentials of both physics and chemistry at the college level. It presumes a working knowledge of physics and chemistry and some calculus.

Beginning with a consideration of the basic concepts of interatomic and intermolecular forces, the author relates them to the structural characteristics of both crystalline and amorphous materials. Then a discussion of such phenomena as diffusion, crystallization, phase transformation, and phase equilibria follows. The first four chapters lay the basic foundation for the specific applications which follow. Until now, much of this information has been available only in specialized higher level reference works or buried in the dusty files of some corporate research laboratory. Of special interest not only because of their complete coverage but because of their inclu-

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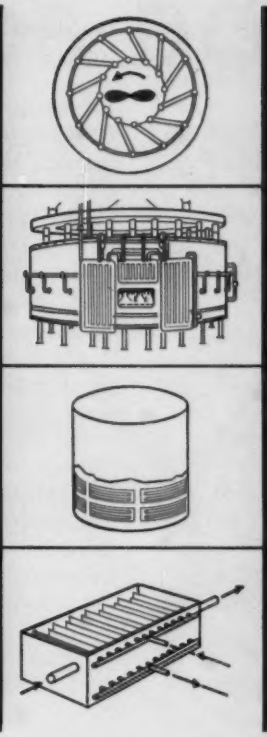

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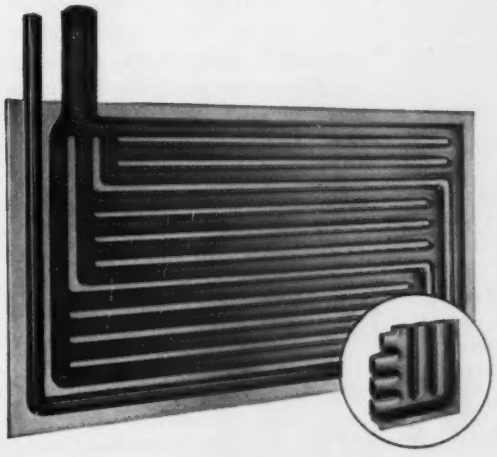

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sion in a book of this type at all, are two sections, one on corrosion and the other on friction, wear, and lubrication.

In general, this is a well produced book of general interest to the professional engineer. The illustrations are excellent, the editing and indexing good. One also suspects that Professor Jastrzebski is an excellent teacher.

WINDOWS AND GLASS IN THE EXTERIOR OF BUILDINGS, by Building Research Institute, National Academy of Science, 2101 Constitution Ave., Washington 25, D. C.; $5.00. Now that the spate of glass wall construction has abated and engineering consultants can expect a more reasonable approach to heating and air conditioning problems, a new analysis of the use of glass in construction is welcome. This then is a series of reports by specialists in the fields of heating, lighting, air conditioning, and ventilation with their applications to residential, commercial, and industrial building design.

RADIOISOTOPES FOR INDUSTRY, by Robert S. Rochlin and Warner W. Schultz; Reinhold, New York, N. Y.; $4.75. In the coming era of applied nucleonics, the application of radioisotopes extends to almost every phase of medicine, agriculture, science, and industry. A random sampling of industries would include plastics, petroleum, paper, paint, steel, mining, food, autos, drug, glass, and textile, to name just a few. The purpose of this book is to show how it is done. In addition, the authors include instructions for personal safety, a discussion of facilities for handling radioisotopes, and an analysis of setup costs.

ASBESTOS: ITS INDUSTRIAL APPLICATIONS, by D. V. Rosato; Reinhold, New York, N. Y.; $5.75. Asbestos is an old familiar product which is undergoing a rebirth in many new forms. This book will serve as a guide to better acquaint engineers with these new products in the fields of building materials, insulation, electrical units, asbestos-cements, filters, friction materials, lubricants, plastics, and many others. The broad usage of this substance in industry is presented along with data on its properties.

U.S. MAP; WORLD MAP; published by Aero Service Corp., 210 Courtland St., Philadelphia, Pa.; $9.95 each. Not strictly in the area of books, but perhaps in the field of literature fall the excellent relief maps published by the Aero Service Corp. Several years ago, this air survey firm, the world's largest, issued a larger (64" x 40") counterpart which cost almost five times what the present version does.

Printed on durable vinyl plastic, these new maps are mounted in mahogany-colored plastic frames and are delivered ready to hang. The 50-state U. S. map is done on a scale of one inch equals 117 miles; the companion World relief map is scaled one inch equals 962 miles. Both maps are 28" x 18" with mountains and valleys shown in detailed relief that stands up nearly ⅛". Each map also contains a handy map index which slides out from the back of the map and locates all the place names shown. The U. S. map shows 4000 geographic names, including 2000 cities and towns, 1000 rivers and lakes, 150 national parks and monuments, and over 200 mountain ranges and peaks; the World map features almost 2500 place names, including 1200 cities and towns, 400 large bodies of water, 450 islands, mountain ranges and peaks, plus many other features.

These maps have been awarded the U. S. Information Agency's certificate of international education materials. This certificate, recognized by UNESCO, will entitle the maps to duty-free entry into 21 countries as accepted educational tools. ▲▲

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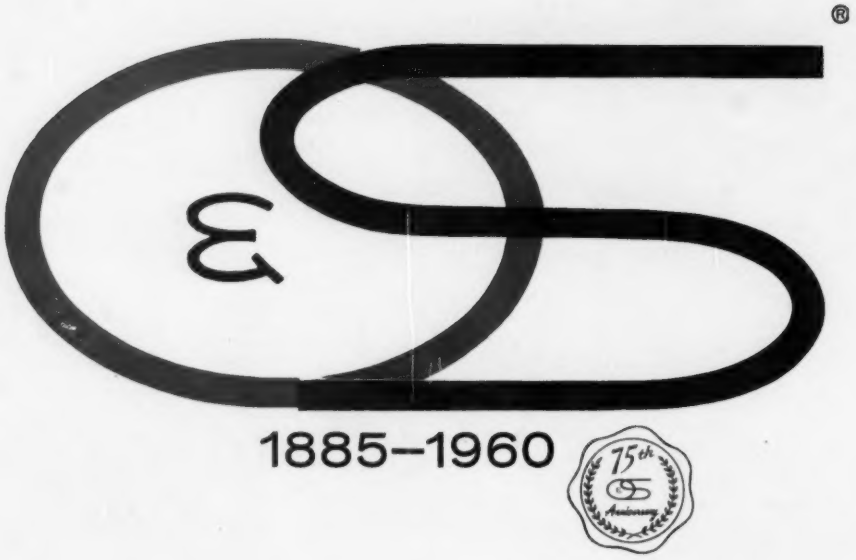

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We are grateful for the skills and sense of responsibility of our engineers and craftsmen, working in the solid tradition of one of America's first metalworking centers. They have met the needs of industry through the years, and developed O&S products to a high degree of reliability and performance.

We don't feel old. We feel younger and more capable than ever, and we make this promise to our friends and customers: We will never rest in our efforts to produce the finest, most advanced boilers and fuel burning systems that it is possible to build.

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Men in Engineering

Russell Field has been named vice president, project development, of Holmes & Narver, Inc., Los Angeles firm of engineers and constructors. Field joined the organization's industrial engineering division in 1954 and in 1957 he was named an assistant vice president of the firm.

FIELD MEISSNER

Robert C. Meissner has been named president of Meissner Engineers, Inc., Chicago. Meissner previously was executive vice president of the firm and administrative officer for all projects in consulting and design.

Announcement has been made of the formation of Vance, Needles, Bergendoff & Smith, Limited, designing and consulting engineers, Woodstock, Ontario, Canada. The new firm will provide complete engineering and administrative services from preliminary studies and investigations through financing, designs, plans, and construction to operation and maintenance of major structures, expressways, airports, and other facilities and projects. Principals of the firm are James A. Vance and Robert R. Smith, of Woodstock, Ontario, together with the eight partners (Enoch R. Needles, Ruben N. Bergendoff, Elmer K. Timby, Theodore J. Cambern, James P. Exum, Ellis E. Paul, Josef Sorkin, and Carl L. Erb), as individuals, of Howard, Needles, Tammen & Bergendoff, consulting engineers, New York, N. Y. and Kansas City, Mo.

Parsons, Brinckerhoff, Hall & Macdonald, consulting engineers, New York, N. Y., has changed its name. The new designation is Parsons, Brinckerhoff, Quade & Douglas.

J. L. Tatman has joined J. R. Miller Company, consulting engineers, New York, N. Y., as metallurgical engineer. For the past three years Tatman has handled foreign assignments in India and Venezuela.

TATMAN GOODYEAR

J. H. Goodyear, formerly regional technical adviser for Olin Aluminum, has started his own consulting firm. The new organization will have offices at 320 West Main Street, Lansdale, Pennsylvania, and will deal with problems in anodizing, organic finishing, painting, plating, special finishing, and plant layout for the foregoing processes. Goodyear is widely known as a metallurgical engineer specializing in metal finishing and has authored many articles for leading metal publications.

Louis A. Cutler has joined the Omaha staff of Henningson, Durham & Richardson, consulting engineers and architects. For the past 24 years Cutler has been chief architect of the Eppley Hotels Company and its successor, the Eppley Division of the Sheraton Corporation of America.

Formation of MacKenzie, Incorporated, management consulting and engineering firm, has been announced by Richard Steel MacKenzie. Headquarters of the firm are in Greenwich, Connecticut. Prior to the formation of his own firm, MacKenzie was a partner in Booz, Allen & Hamilton, management consultants. Also, he was a vice president of Booz, Allen & Hamilton, Ltd., specializing in consulting work for foreign firms doing business in the United States and for domestic firms doing business abroad.

James W. Yarbrough, formerly assistant professor of civil engineering, University of Arkansas, has joined the firm of Harland Bartholomew and Associates and Clark, Daily and Dietz in the firms' Memphis office.

J. David Welch and Martin Malinofsky have formed a partnership for the practice of consulting engineering and geology, with offices at 382 Springfield Avenue, Summit, New Jersey. Both men have been associated with Howard, Needles, Tammen & Bergendoff, consulting engineers of New York and Kansas City. Welch was chief soils engineer and Malinofsky was engineering geologist. Under the name Welch and Malinofsky, the

new firm will begin its practice this month. The partners will specialize in soils and foundation analysis, geologic investigations, materials research and development, and natural resources development. In addition, they will offer special services in air photo interpretation, aerial photo mosaics, terrain models, testing, analysis, reports, designs, & construction supervision.

Allyn E. Webb, formerly executive vice president of Barber-Webb Company, Inc., Los Angeles, has established a consulting service for corrosion problems in industry. The new service, now headquartered at 557 E. Walnut, Pasadena, will cover the 11 western states.

Edgar F. Vandivere, specialist in electronics and physics, has joined Page Communications Engineers, Inc., a subsidiary of Northrop Corp., as consultant to the director of research and development. For seven years prior to joining Page, Vandivere was a partner in Vandivere and Cohen, Consulting Engineers.

Stanley W. Connelly has joined Brisch, Inc., consulting engineers specializing in industrial classification and coding, as vice president in charge of the firm's development and planning.

CONNELLY PERSSON

N. Bert Persson has been appointed vice president of the Food Service Engineering Corporation, Philadelphia, Pennsylvania. Persson has been a professional food facilities consultant since 1939 when he started his own firm under the name of Food Service Equipment Engineering in St. Paul, Minnesota.

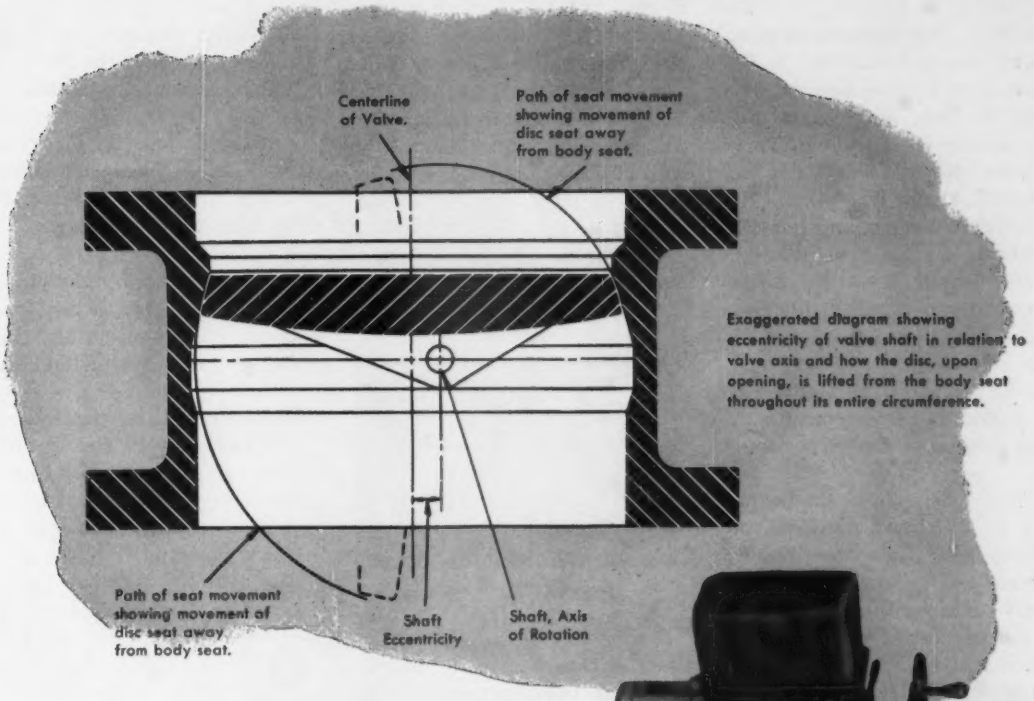
V. B. Bandjunis, formerly Public Works Officer, U. S. Navy, Chelsea, Mass., has joined the staff of Benjamin E. Beavin Company, consulting engineers of Baltimore, Md.

Richard M. Larimer, who resigned recently as Director of the Ohio Department of Public Works, has been appointed assistant to the president of A. M. Kinney, Inc., Consulting Engineers. Larimer will represent the firm in Columbus, Ohio and has established his office in the High-Long Building. Registered both as an engineer and as an architect in the State of Ohio, Larimer formerly was vice president and chief engineer for the Knowlton Construction Company, Bellefontaine, Ohio, and also has conducted his own professional engineering practice.

Gustave A. Heckscher, formerly director of purchasing, has been named new business representative of United Engineers & Constructors, Philadelphia, Pennsylvania. J. Edward Sunkes becomes director of purchasing.

Noah E. Hull, vice president and general manager of the Hughes Gun Company and assistant to the vice president, manufacturing, of the Hughes Tool Company, has been nominated for the office of president of the National Society of Professional Engineers. A registered professional engineer in three states — Michigan, New York, and Texas — Hull currently is serving as National Society vice president for the Southwestern Region.

Six regional vice presidents and a treasurer also were nominated by the 51,000-member engineering group for the administrative year which begins in July, 1960. The vice presidential nominees are: W. Earl Christian, New Bruns-



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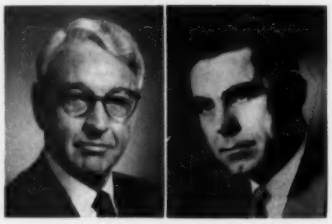
wick, N. J., Northeastern Region; R. King Rouse, Greenville, S. C., Southeastern Region; Benjamin G. Elliott, Madison, Wis., Central Region; Brandon H. Backlund, Omaha, Nebr., North Central Region; Thomas T. Mann, Roswell, N. M., Southwestern Region; and John H. Stufflebean, Tucson, Ariz., Western Region. Russell B. Allen, Silver Spring, Md., was nominated to continue in the office of treasurer.

Mario C. Yon and R. D. MacTavish have joined the management consulting division of Ebasco Services.

Paul Weir, chairman of the board, and J. P. Weir, vice president, of the Paul Weir Company, mining engineers and geologists, Chicago, recently returned from Australia. The purpose of their trip was to examine and evaluate a group of three operating mines and adjacent reserves near Sydney, New South Wales, for potential purchase by a major Australian company.

Edward X. Tuttle, Sr., formerly vice president of Giffels & Vallet, Inc., Detroit, has joined the New York office of Charles Luckman Associates as vice president. While with Giffels and Vallet, Tuttle served as chief architect on such projects as the naval shore facilities at the Naval Operations Base, Norfolk, Virginia.



TUTTLE AUFMUTH

Chief engineer Raymond B. Aufmuth has been appointed to the board of directors of The H. K. Ferguson Co., Cleveland. An 11-year Ferguson veteran, Aufmuth has been engaged in furthering the expansion of the firm's design and construction activities.

Edward A. Moy, P. E., consulting electrical engineer, has moved his offices to 59 North Broad Street, Woodbury, New Jersey.

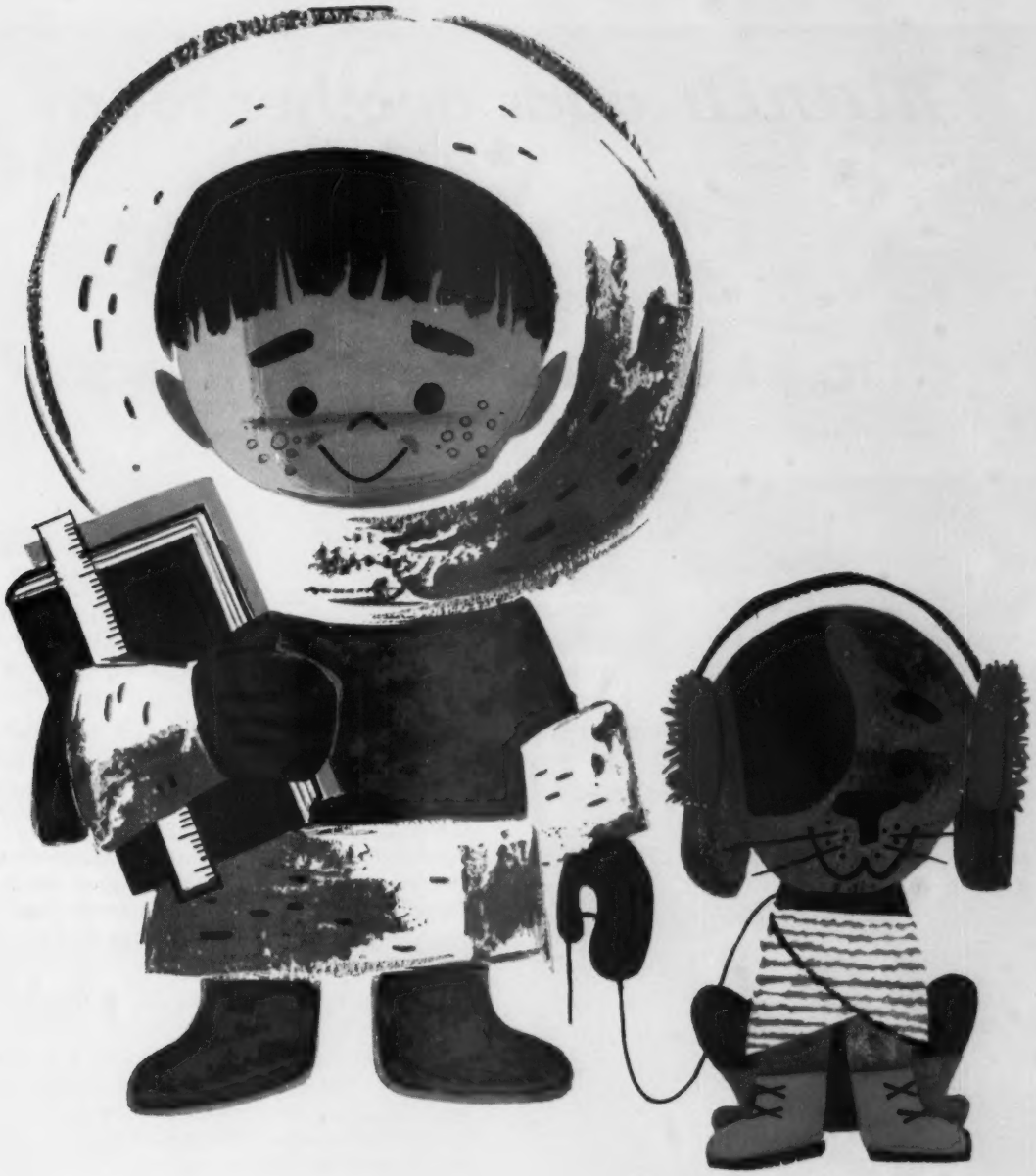
James P. Purcell Associates, consulting engineers, announces the opening of its offices at 3315 Berin Turnpike, Newington, Conn.

Frank Roodman, veteran of 23 years service with The Austin Company, engineers and builders, Cleveland, Ohio, has been appointed assistant manager of the firm's five-state Western District. The district includes California, Nevada, Utah, Arizona, and Hawaii, which are served from headquarters in Los Angeles. Roodman has been engineering coordinator for missile projects at the Austin general offices in Cleveland.

John Requa Sells has become an active member of Chas. H. Sells, Inc., consulting engineers and surveyors, of Pleasantville, New York City, and Rochester, New York. It also has been announced that L. Duncan Olmsted, Jr., Owen M. Quinn, Jr., and Albert J. Raman have become active partners.

Jacob R. Sensibar, president of Construction Aggregates Corporation, Chicago, has been elected national president of the American Technion Society. Sensibar previously served as president of the Midwest Region of the Society — a nationwide group composed of more than 15,000 engineers, scientists, technicians, and industrialists sponsoring the Technion-Israel Institute of Technology.

Clifton T. Kent, formerly senior staff engineer of the Pennsylvania Turnpike Commission, has been appointed assistant executive secretary of the Pennsylvania Society of Professional Engineers.



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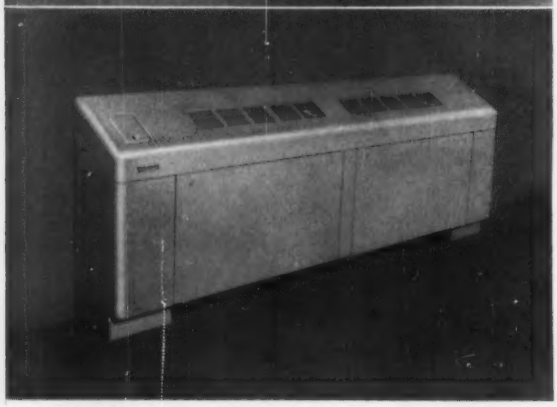

Lambert Municipal Airport, St. Louis

The administration building at St. Louis Lambert Municipal Airport has taken its place among the world's masterpieces of contemporary architecture.

Airline customers have discovered, too, that this dramatic structure by Hellmuth, Obata and Kassabaum blends modern design with unbelievable convenience and efficiency.

Another touch of comfort was added recently with the year-round air conditioning of the three "fingers", or covered walkways, extending from the main building to areas where planes discharge and take on passengers.

Two hundred and twenty-three Marlo "Seazonaire" remote fan coil units of 300 to 800 cfm were installed by Guaranteed Heating and Engineering Company. Using chilled or heated water from a central source, these compact units provide perfectly conditioned air in summer and winter. Consulting engineers for the installation were Ferris & Hamig.

For further information about practical, efficient "Seazonaire" air conditioning units by Marlo, see the Marlo representative in your area or write to us direct.

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Quality Air Conditioning and Heat Transfer Equipment Since 1925

Reporting
The New Projects

Bridge Across the Ganges

One of the great rivers of the world, the unpredictable Ganges, which every flood season forces hundreds of new channels, has been crossed at a 2½-mile span of waterways and islets near Mokameh, India, in the state of Bihar. Originally planned nearly 50 years ago, its recent completion is one of India's major engineering achievements since gaining her independence. The combination rail and road bridge joins the fertile hills and plains of Bihar and eastern Assam with the mineral-rich areas of west Bengal and the industrial complex of Calcutta. Its economic consequences will be tremendous.

The major portion of the structure consists of 14 main spans totaling 6075 feet with four approach spans (two on each side) adding another 500 feet. The lower deck of the bridge has a single broad-gage rail track, the upper deck a 24-ft wide roadway for the heavier vehicular traffic with a 6-ft walkway on either side. It was necessary to erect the girders by cantilevering, an unusual method for spans of this size.

To study the behavior of the truss members in various stages of erection, scale models were built and tested at the Imperial College, London. The forces needed to draw the members into position and the distortion needed to close the joints were assessed from the model.

Contract for construction was awarded to the Ganga Bridge Construction Company of India. Consultant was Freeman and Fox, Partners, of London.

Throgs Neck Bridge Ahead of Schedule

More than four months ahead of the contracted date, the last of 39 approach piers of the New Throgs Neck Bridge across New York City's East River was recently completed. The bridge, a

Approach piers for the new Throgs Neck Bridge have been completed more than four months ahead of schedule.

project of the Triborough Bridge and Tunnel Authority, is scheduled to be opened for traffic early in 1961. Two cable anchorage piers for the two-mile long suspension bridge are being constructed under a separate contract. In all, the bridge's tower and approach piers contain almost a quarter million tons of concrete and 3700 tons of reinforcing steel. Amman and Whitney, of New York, are the consultants for the main suspension bridge and Dr. E. Lionel Pavlo is the consultant on the approaches.

Sewage Projects

The location of sewage treatment plants is a favorite target of public prejudice. As an example, the Dallas consulting firm of Acrey and Stephenson was left with an almost impossible site for a new plant at Anne, Texas. It was located on the ridge of a hill with a grade of almost six percent and with the most desirable portion of the tract already reserved for construction of a proposed U.S. Soil Conservation dam.

To solve the problem, the engineers reversed the usual design pattern and placed the oxidation pond at the top of the hill. The grit chamber, Imhoff tank, and sludge bed were located on down the slope. Underdrain and overflow runoff were piped to the adjoining creek. This arrangement provided several advantages, one of which was the ability to recirculate the sewage lagoon without special pumps. Another was to provide gravity flow from the grit chamber to the Imhoff tank and then to the pumps. By placing the pumps downhill from the Imhoff tank, horizontal centrifugal pumps could be used at less cost than vertical pumps.

At Centreville, Maryland, a special design for grit removal in a sewage improvement project was the responsibility of Van Reuth and Weidner, consulting engineers from Baltimore. This region is overlain with extensive sand deposits and, due to the age of the sanitary sewers, grit removal from the raw sewage is essential to prevent clogging of the sludge drawoff line in the digester section. In the new design grit settling is accomplished in a circular trough attached to the influent well of the primary clarifier, eliminating the long rectangular channels usually provided for this purpose. The grit is washed for separation of organics to any desired degree in the box adjacent to the clarifier. The sewage treatment process proposed is high rate biofiltration at 0.375 mgd.

The firm of Smalley, Wellford, and Nalven of Sarasota, Florida, has had several interesting design problems as a result of the economics involved in the design of small sewage treatment plants. Naturally, the cost per person served is higher than in larger plants, and full time operation with the supervision of a skilled operator is not always feasible. In some areas the high cost of power adds to the problems.

In general these small plant designs incorporate the use of high-rate trickling filter plants using many locally made components which are able to absorb 'shock loads' over a considerable period of time. A minimum of supervision is required and 'fail safe' operation is assured should trouble develop. One of these designs was for a trailer camp of 200 units, able to handle 20,000 gpd and constructed for $20,000. This is a dollar/gallon/day plant. All components except the pumps were obtained locally.

In San Diego, California a new $45 million sewerage project now in the design stage will dispose of digested sludge by piping it six miles to Mission Bay Park. There it will be used as a soil conditioner. The total sewerage project consists of 24 miles of interceptor sewer, a 13,000-ft ocean outfall with a "Y" type diffuser, four pumping stations, and a primary treatment plant. J. M. Montgomery, of Altadena, California, is the consultant. He was sponsored by Holmes and Narver.

The Town of Carboro, North Carolina found that its sewage treatment facilities, consisting of an Imhoff tank and sludge bed, were severely overloaded. An engineering study indicated the

Sewage plant structure built with reinforced brick.

Finished structure is attractive and economical.

need for facilities capable of handling 0.5 mgd, and it was agreed that the additional capacity should be supplied by biofiltration type treatment.

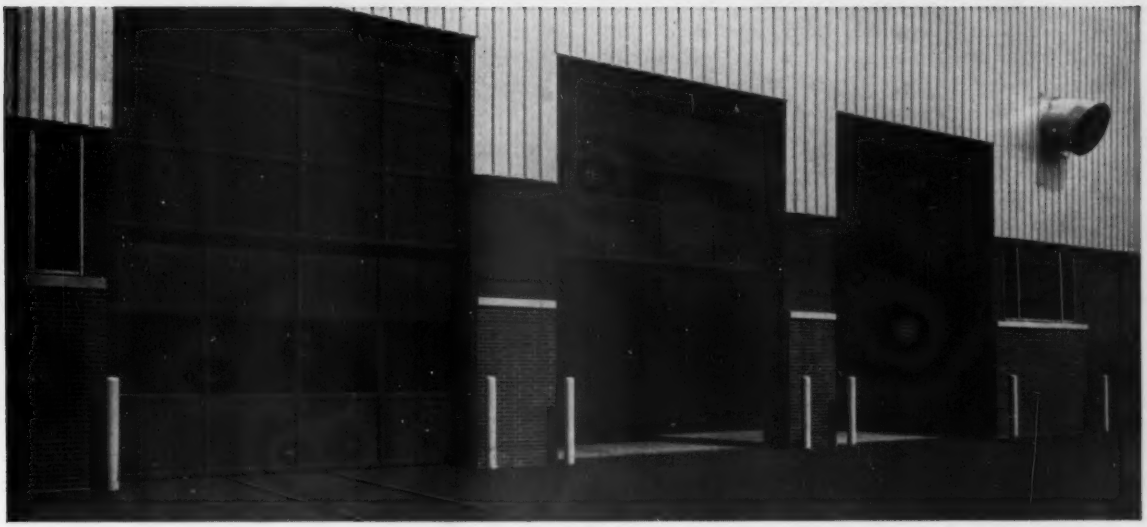
New facilities, designed by John R. Gove, consulting engineer, consist of a grit drying bed added to the existing grit chamber, a primary and secondary clarifier, and a high-rate trickling filter with recirculation. The existing Imhoff tank was converted to an unheated digestor. A lift station also was installed to provide sufficient head for sewage flow to the treatment units.

The most interesting aspect of this sewage installation is the use of reinforced brick masonry in all structures. The system not only eliminated expensive forming but proved to be exceedingly convenient and inexpensive. Total cost for the additions came to $80,250.

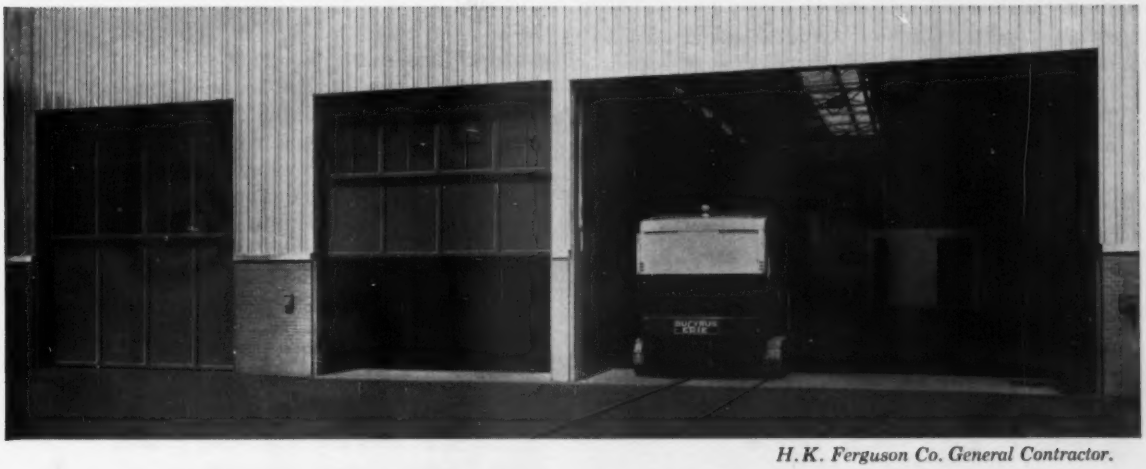
The reinforced brick masonry walls were designed for a working stress of 1000 psi compression in flexure. Design procedures were essentially the same as for reinforced concrete. Allowable shear and bond stresses were 50 psi and 160 psi in accordance with the North Carolina Building Code. The reinforcing steel was placed in a collar joint and concrete was poured from spout type buckets every two or three courses as the brickwork progressed. Mortar for placing brick consisted of 1 part portland cement, ¼ part hydrated lime and 3½ parts of sand. The grout was 1 part portland cement, 2 parts sand and 2 parts small aggregate graded ⅜-in. and down. The bricks were of average quality capable of withstanding approximately 10,000 psi in compression. Tests by Pittsburgh Laboratories indicate that 8″ x 8″ x 16″ high prisms assembled with these components did not fracture under a unit compressive stress of 4200 psi — the limit of the testing machine.

Heavy Concrete for Radiation Shelter

At Hanford, Washington, the use of extra heavy concrete, blown into place by compressed air, will furnish protection for research chemists working in the new high radiation level chemical laboratory now under construction for the Atomic Energy Commission. General Electric specified the use of this dense concrete in the shielding of their hot cell as a design compromise between increasing



BYRNE meets varying door requirements



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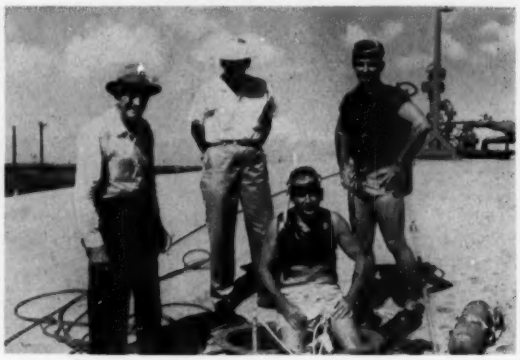
the distance of personnel from experiments and using more dense materials of higher cost. Heavy magnetite ore is substituted for gravel in the concrete, producing a mixture about 50 percent heavier than ordinary concrete and providing 1/3 again as much radiation protection. Thus, four feet of heavy concrete will provide the same radiation protection as six feet of ordinary concrete. A mixture of 5¼ parts of dry iron ore to one part of cement is forced through a rubber hose to a nozzle and the mix is blown into place. B. D. Bohna, the San Francisco engineer who devised the technique, claims distinct cost advantages in eliminating extra heavy forms and providing continuous visual inspection. Also, the completed structure has minimum voids, an important consideration in assuring maximum radiation protection.

Skin Divers Check Digester

J. D. Walker, of Aurora, Illinois, is a skin diving enthusiast of no mean ability. He also is, incidentally, the president of Walker Process Equipment Company, developers of a new type of digester called the Gaslifter. A 70-ft diameter version of this device was recently installed in a sewage treatment plant at Corpus Christi, Texas, and Walker had the opportunity to combine business and pleasure in a convincing demonstration of just what his new circulator-mixer could do. First the digester was filled with water and then Walker entered the tank complete with SCUBA (self



Skin diving was used to demonstrate current velocities and circulation patterns in new digester.

contained underwater breathing apparatus). Then, utilizing puffs of white dye squirted from a plastic catchup dispenser, he was able to accurately measure current velocities and circulation patterns and prove the efficiency of the digester design. Among the interested observers during the demonstration were S. L. Allison, superintendent of the Corpus Christi Sewer Division and William Ziesse, resident engineer for Reagan and McCaughan, consulting engineers. They were enthusiastic about this new approach to logging underwater currents.

Tidal Power Stations for USSR

In considering the use of tidal power stations the alternation of idle and generating periods is the major problem. Soviet engineers are convinced, however, that the great advantage of sea tides lies in their constant average monthly tidal energy and have taken this into account in their designs. At Mezen Bay, White Sea, tides of from 23 to 33 feet have been measured. The eastern part of this bay is to be spanned with a 62-mile long sectional ferroconcrete dam in which are to be installed 2000 turbines. Power from this installation is be to fed into the power grid of the Urals and the European part of the Soviet Union.

Construction of a second tidal power plant is planned in the Lumbovsky Bay of the Barents Sea. This plant is to supply the power requirements of the Kola Peninsula.

Similar construction techniques are to be used in both plants. Docks of rectangular reinforced concrete slabs up to 4 inches thick will be prefabricated on the shore and then towed to the con-

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R-763

struction site and sunk. Bulb-shaped turbogenerators which are known to work smoothly under the effect of alternating fluid flow are to be used. They are fully submerged.

Airport Construction for Kansas

Matching funds in the amount of $57 million for the fiscal year of 1960 has been programmed by the Federal Aviation Agency for airport construction in Kansas. To date only one project has been reported. This is at Norton Municipal Airport for $19,865. Another $63 million has been allocated for the fiscal year of 1961 which begins July 1, 1960. This information is being passed along to all members of the Consulting Engineers' Section of the Kansas Engineering Society for use in their discussions with municipal authorities for the purpose of stimulating interest and further positive action in the building of municipal airports. In an additional effort, the Section also sponsored an exhibit featuring design of airport improvements at the recent meeting of the league of Kansas Municipalities at Hutchinson.

First Intercontinental Power Line

Scheduled for completion in February, 1960, the first aerial power transmission line to connect Europe and Asia is being built crossing the strait of Bosporus. It encompasses a span of 5246 feet. The line will supply more power for the industrial complex of Istanbul. The project is sponsored by Etibank, a development bank empowered by the Turkish government to finance the electrification of Turkey. The U. S. International Cooperation Administration is assisting in this. Stone and Webster, Inc., of New York, are the consulting engineers on the project.

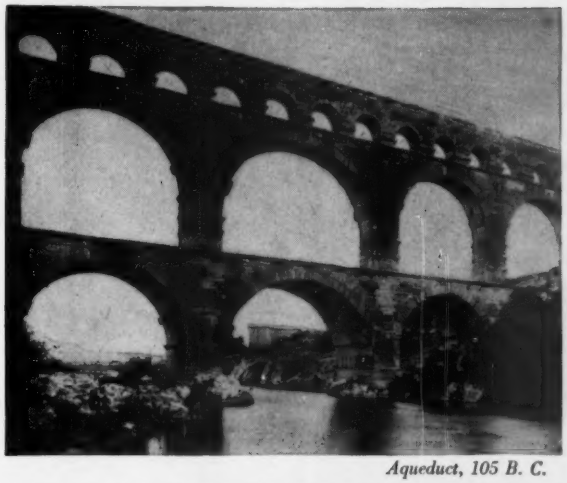
Work is underway on the first aerial transmission line to carry electricity between Europe and Asia.

Deodorizing Sewage

Because of bad planning the best parts of the town of Cannock, in the industrial midlands of England, were troubled by the stench of the town's new sewage works, sited down wind from their homes. A deodorant maker was called in and he installed a special spray unit to neutralize the smells. It did its job quite well, but was expensive, especially since it operated continuously. Engineers solved the problem with an oil-dampened wind-vane which was designed to operate the spray unit only when the wind was in the north and west quadrants.

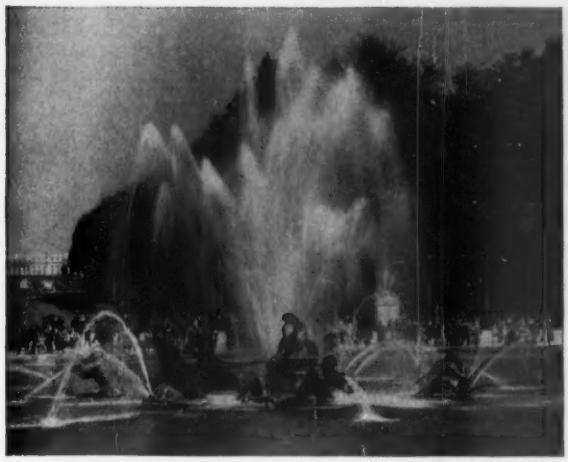
Unusual Church

In their first venture into church design Welton Becket and Associates, engineers and architects of Los Angeles, California, have aroused the nationwide interest of religious and engineering authorities. The $1,355,000 structure will be erected in three stages and will feature the extensive use of thin shell concrete. ▲▲



Aqueduct, 105 B. C.

Cathedral, 1065



Fountain, 1650

Ludlow Hydrant, 1883

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Consulting Engineers' Calendar

Jan. 22. Engineers Joint Council; Annual Meeting, Statler Hotel, New York, New York.

Jan. 23. Illinois Association of Consulting Engineers and Chicago Association of Consulting Engineers; Annual Meeting, Sheraton Hotel, Chicago, Illinois.

Jan. 23-26. Consulting Engineers Association of California; Annual Meeting, Ojai Valley Inn, San Francisco, California.

Jan. 31-Feb. 5. American Institute of Electrical Engineers; Winter General Meeting, New York, N. Y.

Feb. 1-4. American Society of Heating, Refrigerating, and Air-Conditioning Engineers; 2nd Southwest Heating & Air-Conditioning Exposition (Memorial Auditorium) and Semi-annual Meeting (Baker and Adolphus Hotels), Dallas, Texas.

Feb. 3. American Institute of Consulting Engineers; Luncheon Meeting, Engineers Club, New York, N. Y.

Feb. 9. Association of Consulting Chemists & Chemical Engineers, Inc.; Luncheon Meeting, Hotel Shelburne, New York, N. Y.

Feb. 11-12. University of Mississippi; Sixth Annual Mississippi Highway Conference, Campus.

Feb. 18-20. National Society of Professional Engineers; Winter Meeting, Broadview Hotel, Wichita, Kans.

Feb. 21-24. American Institute of Chemical Engineers; National Meeting, Hotel Biltmore, Atlanta, Ga.

March 6-9. American Society of Mechanical Engineers; Gas Turbine Power and Hydraulic Conference, Rice Hotel, Houston, Texas.

March 14-17. American Concrete Institute; 56th Annual Convention and Exhibit, Commodore Hotel, New York, N. Y.

March 15-17. National Association of Corrosion Engineers; 1960 Corrosion Show and Annual Conference, Dallas, Texas.

March 23-26. Electrical Maintenance Engineers Association of Southern California; Electrical Industry Show and Lighting Exposition, Shrine Exposition Hall, Los Angeles, Calif.

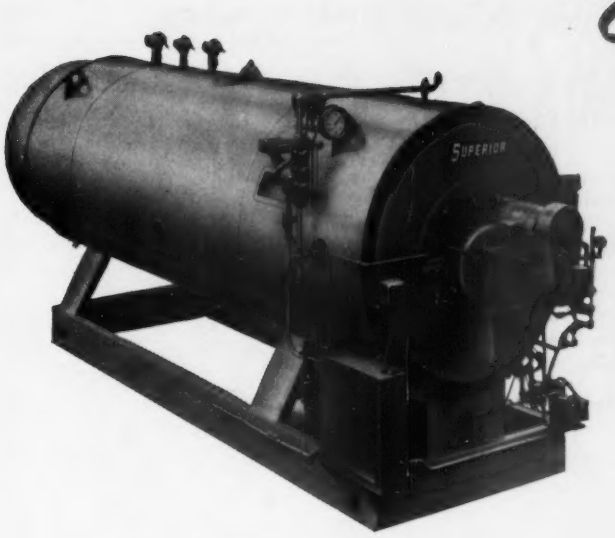
April 3-8. Engineers Joint Council and Instrument Society of America; Sixth Nuclear Congress, New York, N. Y.

April 18. The Producers' Council; Spring Meeting and Board Meeting, Mark Hopkins Hotel, San Francisco, California.

April 18-19. American Society of Mechanical Engineers, Institute of Radio Engineers, and American Institute of Electrical Engineers; Third Annual Conference on Automatic Techniques, Cleveland-Sheraton Hotel, Cleveland, Ohio.

April 19-21. Building Research Institute; Spring Conference, Statler Hilton Hotel, New York, N. Y.

April 27-30. Western Air Conditioning Industries Association; 3rd Western Air Conditioning, Heating, & Refrigeration Exhibit & Conference, Shrine Exposition Hall, Los Angeles, Calif.



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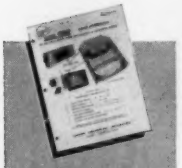

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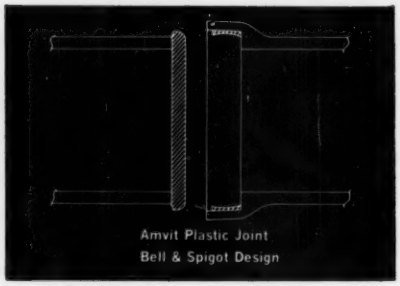

Each year thousands of taxpayers' dollars are wasted on "substitute" materials used in sewer lines. Failure and collapse of non-clay sewers endangers the health of the community. Sewers must be constructed of permanent materials for they carry to safe disposal thousands of tons of waste laden with dangerous and deadly bacteria.

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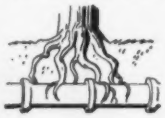
1. ROOTS

force the pipe out of line and clog the system in search of moisture. Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in constant compression. Roots cannot enter the line.



2. CHEMICAL ATTACK

is from acid-laden, high temperature sewage, discharged from dishwashers, garbage disposal units and washing machines. Like the clay pipe, Amvit Joint is acid resistant and will not corrode or decompose like most substitute pipes.

3. FLOW LINE ATTACK

refers to that section of the pipe which lies between low and high water. Grease and scum tend to build up here and act as a solvent on certain synthetic substitute pipes. The design of the Amvit Joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing.

4. EROSION

is the wearing out of pipe by abrasive action of sand and gravel. Soft pipes, such as those made of paper and coal tar, become scratched and roughened and tend to clog up. Because Amvit is a really tight joint, no foreign matter can possibly enter the line.

5. DECOMPOSITION

is the chemical breakdown of the component elements of the pipe. Only clay pipe resists decomposition. Like the pipe, the joint is unaffected by ordinary conditions of underground service.

6. RODENTS AND TERMITES

will gnaw away wrappings and coatings of composition pipe. Amvit Clay Pipe defies even the sharpest toothed rodent and is immune to termite attack.

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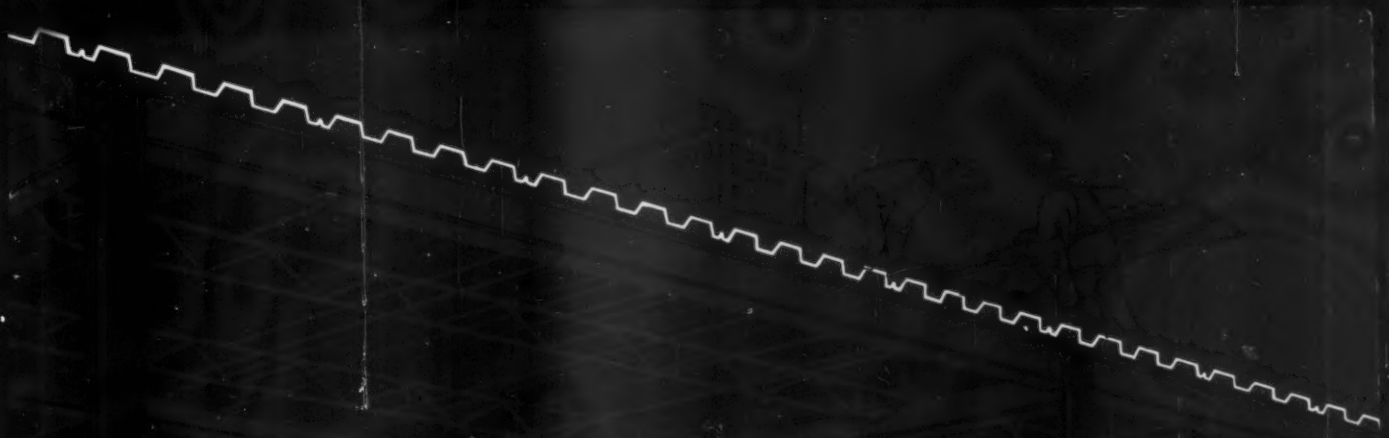

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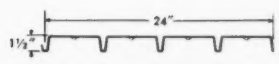
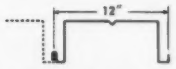
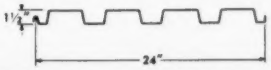


A-DECK — For purlin spacings not exceeding 8'4". Narrow ribs provide deck surface that supports the thinnest or softest type of insulation.

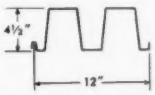


H-DECK — New! For simple spans from 10'0" to 20'0" — 3 and 4½" depths. Especially practical to cover walkways in shopping centers, schools, other installations.



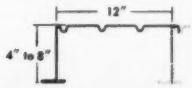
B-DECK — For spans to 10'0". Wide rib distributes metal for greater structural efficiency — gives higher section properties per pound of steel — well suited for use as side wall panels.

B-ACOUSTIDECK — Two-in-one panel combines steel roof deck with acoustical ceiling having Noise-Reduction Coefficient of .70 — used for spans to 10'0".



C-DECK—Carries normal roof loads over spans up to 24'0". Used extensively in canopies.

C-ACOUSTIDECK — Offers same Noise-Reduction Coefficient as B-Acoustideck. Can be used for spans to 24'0".



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Sill-line Radiation is made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa.

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